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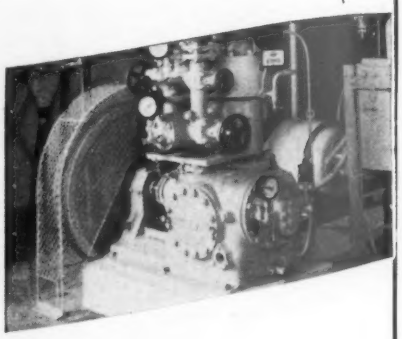
MODERN REFRIGERATION

and Air Control News

Incorporating
COLD STORAGE AND PRODUCE REVIEW
and ICE AND COLD STORAGE

Established 1898

Contents



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Editorial . . . .

Foothold on the Continent
The "British Ass." discusses Low Temperatures
Xth International Congress

● With an eye on the free trade area and the expanding European market, Pressed Steel Company Limited officially opened their attractive new offices and showroom in the Galerie Ravenstein, Brussels, last month. The new premises were declared open by M. Longerstaey, chef du cabinet to the Belgian Minister for External Trade, who commended this example of initiative to other European industrialists. The company's refrigerators are already well known in Europe, and the company now looks forward to a growth of European business in its other two products, car bodies and railway wagons. " A vast proposal like the establishment of an area of free trade ultimately embracing all countries of the European Continent is not just another 'trade treaty,' " said Mr. J. R. Edwards, managing director of Pressed Steel Company Limited, " it is an act of history—an act that one day may well lead to the creation of the United States of Europe which should be a great power for peace in the world and enable us to live and prosper together like equal members of one great European family."

● The British Association meetings at Glasgow University covered a very wide field of knowledge with attention to the study of temperature impact over a field as heterogeneous as insect life on the one hand to nuclear reactors on the other. Special attention was given to the paper "Some biological effects of low temperature" in which Dr. A. S. Parkes outlined recent experimental work on whole animals cooled and frozen to various temperatures, the freeze drying of viable materials and the long-term preservation of cells, tissues and animals. The freezing and storage of sperm, the resuscitation of frozen mammals, the acclimatization of insects to low temperatures and similar papers covered various aspects of this same field. In the more purely practical field the meeting covered a subject such as losses in small refrigerator compressors, indicating the breadth of interest within the general framework of the 3,000 members attending this annual conference.

● The widespread use of artificial insemination in animal breeding has stimulated much research into the development of suitable conditions for storing semen in order the prevent waste and make the greatest use of valuable sires. By cooling semen to temperatures slightly above zero, potential fertilizing capacity may be retained for several days, but until recently lower temperatures causing freezing were generally found to be exceedingly harmful. Between 1949 and 1950 it was discovered that sperm of several species could be protected against damage during freezing by adding glycerol to the semen and by slow cooling. These developments opened up the interesting possibility of long-term storage of semen at very low temperatures, it was revealed at the Glasgow meetings.

● Experiments have now been carried out with many of the laboratory and farm animals and, in all species examined, it has been found possible to preserve the capacity for motility of at least some of the sperm during storage at very low temperatures, but there are marked variations. These variations are reflected in differences in the sensitivity of sperm to the rate of freezing and in the quantity of glycerol or other protective substance necessary to preserve them. No sperm survive very rapid freezing and damage may be associated either with internal crystallization or temperature-shock. By contrast, during slow freezing the increase in concentration of salts which occurs when water is removed as ice may be lethal and glycerol and some other neutral solutes can reduce this effect.

● One of the earliest accounts of resuscitation of a human being who apparently had been frozen to death was published in the *Scots Magazine* in 1756. During the succeeding two centuries it was firmly established that adult non-hibernating mammals maintain a constant internal temperature of approximately 38° C. (98° F.) at any temperature to which they are likely to be exposed under natural conditions. The skin and extremities cool to much lower temperatures than the internal organs and may become frozen without any change in the deep body temperature. By 1948, it was fully established that non-hibernating mammals can survive cooling to a certain degree but that when the temperature falls below a certain lethal level, characteristic for each species and approximately 20° C. above freezing point, breathing and heart beats stop. The animals do not recover spontaneously and were thought to be dead. Higher mammals are in a state of surgical anaesthesia when the body temperature is reduced to between 28° and 30° C. and this is a range of temperature to which patients are cooled for surgical operations on the heart and other vital organs. The human body is not frozen even when cooling is carried out by surrounding the body with ice packs or icy water.

● The safety code sub-commission of the International Institute of Refrigeration (commission III) is to meet in Turin from October 14 to 16 to co-ordinate the work carried out since the Heidelberg session last spring. The meetings will be held at the new Polytechnic building (Corso Duca degli Abruzzi) of the Technical Physics Institute. Visits will also be made to works and places of interest in the vicinity. Much more can be achieved by personal contact and discussion than by the cold medium of correspondence, but as the same individual members of commission III concerned with the forthcoming Turin meeting also took part in the September meeting of the I.I.R. in Moscow and that of I.S.O. in London one begins to wonder whether, even in these days of quick travel, these public-spirited refrigerationists can do justice both to their institutions and their more mundane activities.

● Some valuable papers were presented at the Moscow meetings. Dr. H. L. von Cube and G. Tofahrn discussed economical condensers for household refrigerators. The authors, from Brown, Boveri and Company, Mannheim, showed how development has led from the extended surface condenser to the condenser located at the back of the refrigerator which is essentially a wire and tube condenser or a welded sheet condenser. In both cases, higher heat transfer values than with extended surface condensers may be obtained, because of shorter ways of flow and of good conditions of heat reflexion. The cost of materials for the condensers alone amounts to about 80 per cent. The chief cost is due to piping. For this reason, the efficient use of the piping is important. It appears that the most satisfactory spacing of the tubes is about 60 mm. for the wire and tube and the welded sheet condensers. For more accurate comparisons, the complete process of manufacture must be studied. The manufacture of an American wire and tube condenser is much more automaticized than that of a German welded sheet condenser. A decrease in the cost is possible thanks to a more efficient use of the tubes and by the construction of a condenser without tubes. In the latter case, it would be difficult to obtain satisfactory impervious welding.

● The D.S.I.R. made the recent International Shipping and Commercial Fishing Exhibition at Kingston-upon-Hull the occasion for spreading the gospel of freezing at sea. The two main problems facing the distant water trawling industry are supplying fresher fish and finding ways of reducing costs. One of the most effective ways of reducing costs is to arrange for the trawler to spend a longer time on the fishing grounds. The limitations of the use of crushed ice as a preservative cut short the stay on the fishing ground even though the hold is not full. A better method of preservation would allow the stay on the grounds to be extended. With such an improved method of preservation, the economic optimum speed of the trawler is lower, and the costs of machinery and fuel are very much less. By using the latest machinery designs it is possible to reduce the space occupied by propulsion machinery and fuel and increase the space and capital available for processing plant and stowage of fish. In this way the voyage of a trawler of 185 to 190 ft. can be extended by several days. The savings in costs, particularly in fuel and in the number of ships required to land a given amount of fish in a year, are likely to be more than enough to cover the costs of freezing, storing and thawing. The capital cost is likely to be no higher than that of some recent motor trawlers. The *Northern Wave* experiment in 1956 demonstrated that whole headless sea-frozen cod were equal to very fresh iced fish and could be processed and handled in all the usual ways even after several months of storage. The fishermen had no difficulty in operating the plant at sea. The method was therefore proved in the technical sense, but economically speaking the advantages of extending the trip, and of saving fuel, could not be demonstrated because of the conditions of the experiment. In the economic analysis of the designs now put forward, the costs derived from the *Northern Wave* were used and it was assumed that thawed headless cod would sell at average prices equivalent to those of iced cod.

● In trawlers of 185 and 190 ft. it would still be necessary to stow a considerable proportion—up to two-thirds—of the fish at ice temperature, because there is still not sufficient space to freeze the whole of the catch. The frozen part of the catch would on average represent the extension of stay on the fishing grounds as compared with the normal voyage, and the chilled fish would be equal to the normal catch.

● We have the pleasure to distribute in this issue this month, on behalf of the organizing committee in Denmark of the International Institute of Refrigeration, some literature and enrolment forms relating to the forthcoming (August, 1959) Xth International Congress of Refrigeration to be held four years after the highly successful Paris event. If further information is needed the honorary secretary for the U.K., I.I.R., Maclaren House, London, S.E.1., would be glad to supply it.

NEWS OF THE MONTH

Refrigeration and A-c. Exports.—During August, 1958, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £558,966 weighing 825 tons, was exported from the United Kingdom. Comparable figures for August 1957 were 1,493 tons, worth £997,236.

* * *

Exports' Analysis.—Of the 825 tons of air-conditioning and refrigerating plant worth £558,966 exported by Great Britain in August—quoted in the preceding paragraph—42 tons went to the Union of South Africa, 92 tons to India, 33 tons to Australia, 39 tons to New Zealand, 110 tons to Canada, 174 tons to " other Commonwealth countries," 21 tons to Eire, 15 tons to Sweden, 45 tons to Western Germany, 17 tons to the Netherlands, 10 tons to Belgium, 26 tons to France, 31 tons to Italy, and 170 tons to " other foreign countries."

* * *

Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during August, quoted in the first paragraph, commercial refrigerators accounted for 99 tons, worth £59,335, industrial plant and equipment for 85 tons, worth £60,267, and parts for all non-automatic refrigerating machinery, for 240 tons, worth £181,838.

* * *

Exports of Small Refrigerators.—During August, 1,016 tons of complete refrigerators (domestic, including complete mechanical units) were sent overseas from Great Britain. These exports were worth £695,077. The 1,016 tons comprised 84 tons to the Union of South Africa, 25 tons to Rhodesia and Nyasaland, 6 tons to India, 62 tons to New Zealand, 464 tons to "other Commonwealth countries and Irish Republic," 6 tons to Sweden, 6 tons to Western Germany, 11 tons to the Netherlands, 35 tons to Belgium, 70 tons to Italy, and 626 tons to " other foreign countries."

* * *

Dutch Firm's Centenary.—Grasso's Koninklijke Machinefabrieken N.V. (Grasso's Royal Engineering Works Ltd.), at 's-Hertogenbosch, Holland, recently celebrated its centenary. A small factory founded in 1858 expanded to an engineering works for the flax industry. With the rise of the margarine industry, Grasso manufactured the first margarine producing plants. In 1900, a start was made with the production of refrigerating plants, followed by compressors for various gases. Air compressors were next developed, leading to a compressed air technique department, to which was added the manufacture of pneumatic implements after world war II, for which purpose a separate company was founded at Nijmegen. The firm has its own offices at Brussels, Muelheim, Istanbul, and Mexico City. The Netherlands factories are working to capacity and have more orders in hand than a year ago. They employ 600 personnel.

* * *

ASRE to meet in New Orleans.—For its 45th semi-annual meeting, to be held at the Roosevelt Hotel, New Orleans, La., December 1-3, 1958. The American Society of Refrigerating Engineers is arranging a heavy technical programme, consisting of twelve papers by leading authorities in the refrigeration and air conditioning fields, backed by three conferences and six fora. There will also be a research exhibit featuring the outstanding and precommercial development work of twelve manufacturers. Customary council and committee meetings will be held on directly preceding days as well as upon those with scheduled programme events. The New Orleans section, as host for the occasion, has plans for a social programme of memorable proportions. Outstanding in interest will be the vote on December 1 to decide whether or not the members approve merger with the American Society of Heating and Air Conditioning Engineers. Member of A.S.H.A.E. will ballot upon the same question at a special meeting to be held on the same date in Chicago.

* * *

1959 International Plastics Exhibition.—A record number of over 270 firms from 11 different countries have already applied for stand space in next year's International Plastics Exhibition at Olympia, London, June 17 to 27. A ballot for the allocation of exhibition space will take place at the offices of the British Plastics Federation, 47/48, Piccadilly, London, W.1, on Tuesday, October 14. Exhibitors will be placed in one of three categories : Category A, for those who have been in two or more previous British Plastics Exhibitions ; Category B for exhibitors who were in one previous Exhibition and Category C for new exhibitors. Within each group there will be separate ballots for space according to size required. In attendance at the ballot will be Messrs. N. B. Punfield, chairman, British Plastics Federation ; D. Radford, vice-chairman, British Plastics Federation ; A. Skan, chairman, publicity committee, British Plastics Federation ; C. E. Wallis, chairman and managing director, Associated Iliffe Press Ltd. ; John L. Wood, exhibition manager, and Phillip Morgan, convention manager.

Controlling Potato Sprouting.—Sprout growth of potatoes is inhibited at 10 degrees C. by a concentration of 15 per cent. of carbon dioxide in the storage atmosphere, decreased by lower concentrations and stimulated by still lower concentration. So says Mr. W. G. Burton, of Ditton Laboratory, writing in the technical press; he states that the optimum concentration for growth need not necessarily be the same in all cases, but appears to be about 2 to 4 per cent. Sprout growth is stimulated by reducing the concentration of oxygen in the atmosphere to 5 per cent. A reduced oxygen tension causes augmented growth by means of an increase in the number of sprouts or in the number of cells in individual sprouts. A raised carbon dioxide tension causes an increase in the number of cells in the sprouts and also marked cell elongation. Over the 10 to 25° C. range the effect of temperature upon respiration and upon the solubility of gases could be an important factor in sprout growth.

* * *

International Standards Organization.—The council of the British Refrigeration Association entertained to luncheon last month the delegates from 10 countries to the inaugural meetings of a committee formed by the International Standards Organization to co-ordinate and develop international standards in the field of refrigeration. Mr. J. A. Howie, vice-chairman of the Association, presided at the luncheon, the chief guests being Sir Roger Duncalfe and Dr. Ezer Griffiths, presidents, respectively, of the International Standards Organization and the International Institute of Refrigeration. Lord Dudley Gordon, chairman of the committee, also attended.

PICTURE OF THE MONTH

★

A vast, new cold store for Birds Eye Foods Ltd. was opened by that firm last month at Lowestoft. Details of these premises appear on page 1021 of this issue.

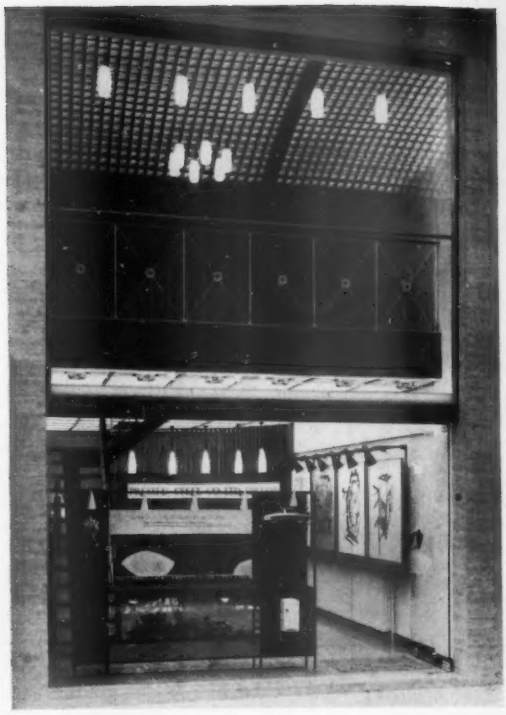
British Firm Poised for Attack on "European Free Trade" Market

PRESSED STEEL OPEN UP IN BRUSSELS

AN operation which will almost certainly have far-reaching effects on a section of the British refrigeration industry was launched last month by The Pressed Steel Co. Ltd. of Oxford.

"M.R.'s" representative was present on the 16th instant at the formal opening by an official of the Ministry of External Trade of the Belgian Government of showrooms and offices in the palatial new Galerie Ravenstein, Brussels—a high-class arcade in the fast-developing area of the Belgian capital—a stone's-throw from the head-quarters of Sabena Airways.

Naturally, not only will the new centre be for fostering expanded business in refrigeration plant but in car bodies and railway rolling-stock, in which fields Pressed Steel are pre-eminent.



The new Brussels showrooms and offices of Pressed Steel Company Ltd., manufacturers of refrigeration equipment, car bodies and railway wagons, are in the new Galerie Ravenstein.

The new centre will be in the charge of Mr. J. Bream, well known to many of our readers through his long connexion with Cowley. A further step in establishing this footing on the Continent has been the appointment of Mr. R. N. J. Hanslip as territory manager, Europe. Mr. Hanslip held a similar position with Dunlop Rubber for some time.

The long-established and successful distributorships which Prestcold have maintained for so long will, of course, continue to operate and they will have the advantage of this closer office backing.

Mr. J. R. Edwards, managing director of the Pressed Steel Co. Ltd., at the opening ceremony, said, in part :—

" I am extremely happy that this little ceremony to-day should take place in Brussels—a city which in this year of 1958 has won itself world-wide acclaim for the conception and execution of such a magnificent project as the World Fair. It is no accident that we in Pressed Steel Co. have chosen Brussels as the centre for our first permanent base in Europe, for we know full well what an important role this splendid city is playing in the new economic organization of Western Europe. It is because of these new developments in Europe that my company decided to establish a permanent operational base this side of the Channel. When the ' common market ' project first began as a serious reality, it became apparent to us that we must take active steps to expand our business connections in Europe. This thought was strengthened when the proposal for a European free area was put forward. We all know that many complex difficulties have to be overcome before this grand design can become a reality. Every serious English business man is well aware of this. A vast proposal like the establishment of an area of free trade ultimately embracing all countries of the European Continent is not just another ' trade treaty.' It is an act of history—an act that one day may well lead to the creation of the United States of Europe which should be a great power for peace in the world and enable us to live and prosper together like equal members of one great European family.

" It may well be that the final form of the free trade area will be rather different from what was originally suggested. In my view, and I think in the view of most thoughtful Englishmen, that matters little. What matters is that ultimately we reach agreement that leads to the effective abolition of trade barriers and trade restrictions among the nations of Western Europe. And I am confident that, in the fullness of time this will be achieved," went on Mr. Edwards.

" Those of you over here who know anything about Pressed Steel Company and its products probably know so because of our famous Prestcold refrigerators which for many years past have had good sales in Europe, thanks to the wholehearted co-operation of our European distributors —many of whom I am delighted to see here to-day. And at this point I should like to take the opportunity of saying how very grateful we are and how we value our connexion with them.

L. to R.: Mr. Maurice Connelly (Pressed Steel), M Longerstaey, Chef du Cabinet, M. Maurice Robert, Mr. D. D. Hobday (Pressed Steel).

" Although we are one of the largest British manufacturers of refrigeration equipment with a substantial export trade to many parts of the world, I should not like you to think of us only as a company of refrigerator manufacture. In England we are, perhaps, better known as the largest independent manufacturer of car bodies producing 40 per cent. of the total number of vehicles bodies in England—bodies for cars with such famous names as Rolls Royce, Jaguar, British Motor Corporation, the Rootes Group and many others. We are also one of the largest British manufacturers of railway rolling stock, and are well known in this field in the world markets. Several thousand rail wagons have been supplied, for instance, to Australia and India.

" All in all, we employ some 17,000 workers and we have factories not only at Cowley, Oxford, but also at Glasgow, Swindon and Reading. Our plant is one of the most up to date in the country and we have available vast research facilities."

Among those attending this ceremony were :—

Distributors and friends :— M. L. de Rest, director-general of Federation de Associations de l'Industrie et du Commerce de l'Automobile (Fedica), 22-24 rue du Luxembourg, Brussels; Mr. Maurice Robert, Mena-Lux S.A., Switzerland; M. Pierre Geuens, Molimex & Vanandel S.A. Brussels; M. H. Scholler, G.E.L.E.C. Brussels; M. J. Donderlinger, G.E.L.E.C. Brussels; M. Jean Jespers, G.E.L.E.C. Brussels; M. George Berzs, S.I.E.D.A. Paris; M. Eef Zevenhuisen, T.H. Vanandel N.V. Rotterdam; Mr. R. M. Griffiths, Ola, S.A. Brussels; Mrs. Nimmrichter Eichberger & Co., Vienna. "Official" quarters were represented by Mr. John Cotton, O.B.E., commercial counsellor, H.M. Embassy, Brussels, and others; M. Charles Tisthoud, vice-president de la Federation Nationale des Chambres de Commerce et d'Industrie de Belgique, Brussels; M. Jules Dautrebande, Chambre de Commerce de Brussels; M. Alphonse de Cunchy, directeur general de l'Office Belge du Commerce Exterior, Brussels; M. Saint-Maur, Chambre de Constructeurs d'Automobiles, Paris; Mr. T. Whittaker, director, British Refrigeration Association. Naturally, there were many executives from Cowley present, including Mr. E. J. Edgington and Mr. J. N. Lampson.

Mr. J. R. Edwards, managing director Pressed Steel Co. Ltd., chats with guests at the opening.

PLASTICS INSULATION FOR REFRIGERATED VANS

A special purpose refrigerated body by Locomotors Ltd., for Neilsons (Ice Cream and Frozen Foods) Ltd., on a 5-ton diesel powered Commer N.C. chassis and cab, is completely insulated with expanded polystyrene, the joints being sealed and covered.

Bitumastic vapour seals are incorporated in both exterior and interior. Alloy panelling is used inside and out, with lapped and sealed joints throughout. The roof is of glass fibre.

Inner and outer framing, of selected English ash and oak impregnated with wood preservative, is staggered.

Quickly detachable traps are fitted to the refrigeration unit compartment and the heavily insulated refrigerator door has sealing gaskets, all bearing hinges, and lock with panic bolt.

Insulated storage space is approximately 430 c.ft., cooled by a Frigidaire 3 h.p. refrigerating unit with a Lister diesel engine as auxiliary drive.

The rear compartment serves as air lock and storage space with twin rear doors closing over low level steps.

TRANSFORMATION OF AN OLD COLD STORE

A Photorecord by "Modern Refrigeration"

Fish Fillets now being Processed at Gravesend Premises

FROZEN Fresh (Fillets) Ltd., an associated company of the Icelandic Freezing Plants Corporation recently placed on the British market their fish sticks and uni-portion and for the processing of these have established a plant and cold store within easy reach of London.

The photograph on page 976, therefore, has some historical interest and perhaps will arouse some sentimental memories in certain quarters.

The construction of this cold store is of the timber studding and granulated cork type and was designed for operation of 14° F., but as was usual

This view of a wooden lined chamber (a start has been made on stripping this) gives some idea of the condition at the commencement of re-equipment.

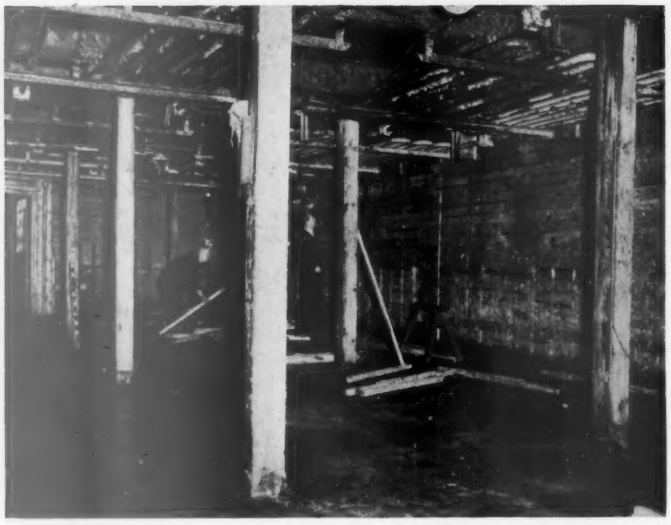
The premises of the old Gravesend and District Ice and Cold Storage Co. Ltd. were acquired for this purpose, the siting of this cold store having the advantages of easy access from both road and river.

In order to render these premises of 46,000 c.ft. suitable for the purpose of the new project, a certain amount of alteration had inevitably to be undertaken. This involved the removal of the ice-making tanks and the formation of a production line in the same area. Incidentally, this brings back memories of the opening ceremony which was conducted 32 years ago and attended by many well-known personalities in the refrigeration world.

when this cold store was built, no attempt was made to incorporate a vapour seal, with the result that now the insulation contains a considerable amount of moisture.

The cost store consists of four chambers, two side by side on the first floor and a further two side by side immediately over the first-floor chambers.

Initially, it was decided to adapt only one first-floor chamber to suit the new business, leaving the other three to continue operating as before. Adaptation of the other chamber was to be undertaken as and when the growing demand for fish sticks made itself felt.



Another view of the first chamber to be tackled—deterioration can be seen on all sides.

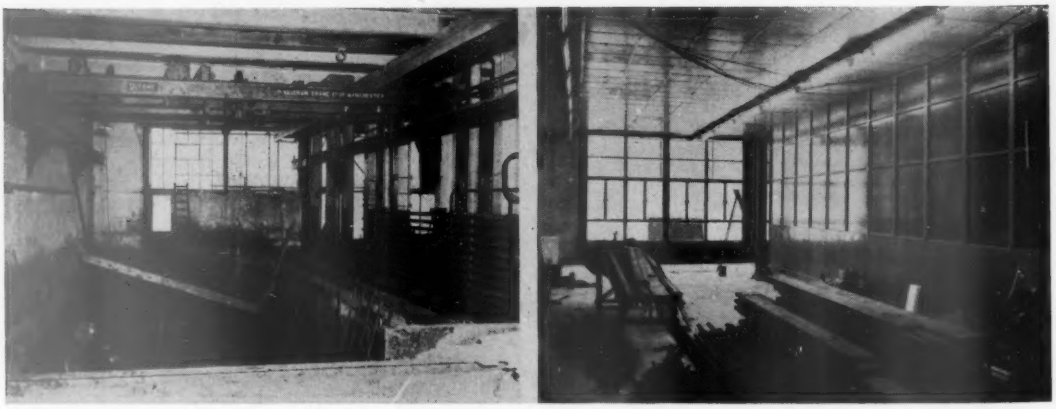
It was decided right at the start that to adopt a Minikay dehydrating system would kill two birds with one stone. To fit a Minikay drying layer to the existing insulation would result in removing all the accumulated moisture from the insulation and, at the same time, thicken the insulation sufficiently to cater for the lower temperature now required.

To enable a suitable Minikay system to be designed, it was first necessary to determine the precise moisture content of the old insulation and timber studding. To obtain this information eight samples were taken from widely separated positions in the walls and floor. The method of sampling was to bore a hole through the inner boarding. The chips from the hole were carefully collected and then a sample of the granulated cork removed. The whole mixture was immediately sealed into air-tight glass jars and sent for laboratory testing to determine moisture content. The results of these tests were as follows :—

Sample No.	1	65·6	per cent.	of dry weight.
,,	2	20·4	,,	,, ,,
,,	3	132·8	,,	,, ,,
,,	4	96·2	,,	,, ,,
,,	5	10·9	,,	,, ,,
,,	6	57·5	,,	,, ,,
,,	7	19·9	,,	,, ,,
,,	8	90·3	,,	,, ,,

This equals an average of 61·6 of dry weight. This water content indicated that there was a

The large ice tank after it had been stripped of its gear; the tank was covered over and a processing floor (right) was obtained.



total of about 800 gal. of water in the insulation. It was decided that it would be reasonable to attempt to remove this in about five years. In addition, the plant had to have capacity sufficient to remove all water vapour as it entered the insulation.

It was decided that no additional insulation was required on the wall dividing the existing +15° store from the new −10° store. There were, however, a number of stanchions running up this wall and these were given 3 in. of additional insulation. At the river end of the store, it was decided to enlarge the existing airlock into a material handling space the full width of the store so a complete new, free-standing wall was built.

For the other side and end wall and the floor, it was decided to fit extra insulation to cater for the lower temperature and to incorporate Minikay to remove the existing moisture. The existing timber lining in the walls was to be drilled with $\frac{1}{8}$-in. holes at 6-in. centres after which 4 in. of insulation in two layers was applied. The second of these layers is grooved on the warm face for the passage of the drying air. The old asphalt finish on the floor was removed, the timber underneath drilled and one single layer of 3-in. grooved cork applied. There was a topping layer of $1\frac{1}{2}$ in. granolithic concrete.

The Minikay system comprises a small centrifugal fan capable of handling 75 c.f.m. against a pressure of 3-in. static water gauge. The air from this fan is passed over a finned tube evaporator in which the temperature and dew point is lowered to about 7° below that of the store. The air passes into a galvanized metal duct running the length of the long wall at the top corner. This duct is drilled along its length with small holes so that the air can go into the cork evenly distributed. The air travels down the grooves in the wall and across

Grooved cork slabs being fixed in position on the walls to allow air circulation.

The refurbished interior of the main chamber.

those in the floor to be collected in a second duct similarly drilled stretching the length of the floor. It is then returned to the fan. Small subsidiary ducts and channels were used to supply air to the end walls.

The air after it leaves the dehydrator is warmed because the air duct and the drying layer are buried in the cork. This additional heat lowers the relative humidity and thus gives the air the necessary drying power to remove the water from the insulation.

In this store as constructed, there was no form of vapour barrier. As far as the floor was concerned, it was decided to remedy this by applying galvanized sheet metal to the ceiling of the room underneath, the joints in the sheeting being sealed with a bitumastic vapour barrier. On the walls it was not possible to do this ; it was originally not intended to use any vapour barrier other than the slight resistance offered by the brickwork. However, during the course of the conversion, it was found that the wood grounds in the walls were too rotten to support the new insulation. It was decided that it was more economical to fit 6 in. of new insulation on this wall. The opportunity was taken to apply a vapour barrier of Berry Wiggins's Aquaseal 25. Even when this had been done, there were large gaps in the vapour barrier between the sheet metal and the bitumen on the wall. These gaps could not be closed without stripping out the floor and this was not considered desirable. During the course of the work, all existing timber in the store was treated to eradicate fungus growth.

On the door at each end of the store, a Miniveil was fitted so that no airlock was required.

Above: The Miniveil installed above the main chamber door.

Right: A group taken, 32 years ago, at the opening of the original store. How many personalities can be identified by our readers ?

Modern Refrigeration Plant in a Frozen Foods Factory

THE redesigned refrigeration systems at the Cleethorpes factory of Eskimo Foods Limited are now more closely linked to specific freezing and chilling duties than hitherto. The factory provides, incidentally, a most interesting line-up of various freezing methods, namely, batch, with static trucks in air blast, continuously moving trucks in air blast and plate freezing.

The refrigeration plant now handles five blast freezers, eight plate freezers, a freezing tunnel, a Winchester froster, a cold room and a chill room.

The total refrigeration load in the factory is approximately 345 tons refrigeration or 4,150,000 B.t.u. per hour, requiring a total of 1,265 h.p.

G. Williams Engineering Company Limited were responsible for the design of the plate freezing scheme and for the manufacture and erection of both the plate freezing and the blast freezing plant and equipment.

From the date of receipt of instructions, the complete installation for plate freezing and blast freezing was designed, manufactured, delivered and erected in 7 months and went into full production in July, 1958.

Blast Freezers

There are five blast freezing chambers, each in the form of an insulated room, the insulation being polystyrene. The insulation construction was carried out by C. L. Whittaker and Company Limited of Grimsby.

Each chamber is provided with two gilled tube air cooling batteries mounted side by side, each

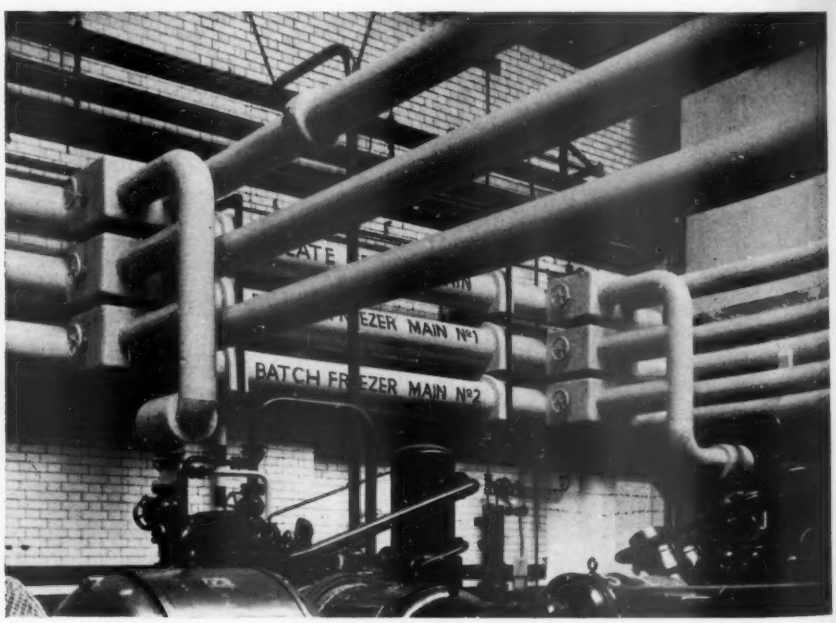
View of entrances to batch freezers.

with a Woods 24 in. dia. axial flow fan and the necessary trunking.

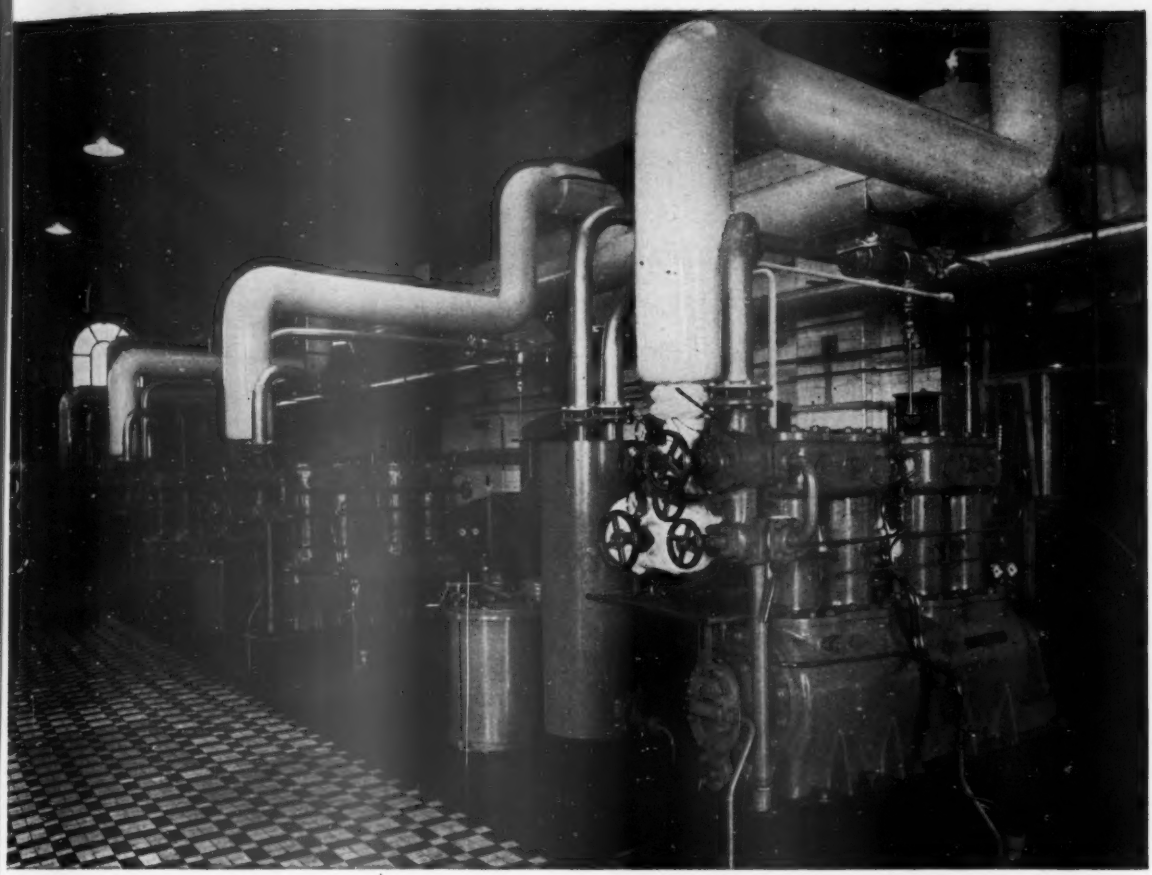
The two coolers are supported on channel iron feet and are complete with a drip tray to carry away water during the defrosting process. Defrosting is carried out by hot gas.

Air is drawn through the coolers and delivered from the fan end at high velocity, the streams of air being split within the trunking to give an even distribution over the product.

The product is carried under the coolers on a wheeled trolley, this trolley being provided with a number of shelves. The product is packed in the trays and the trays rest on the shelves of the trolley (the photograph of the blast freezing room shows a trolley in use).



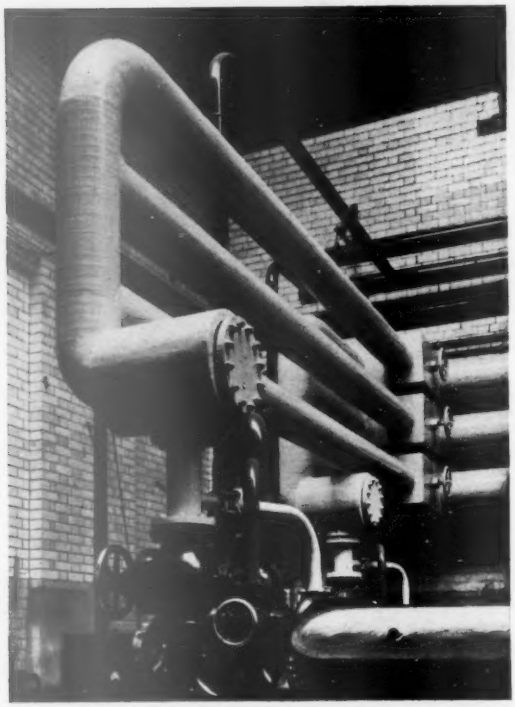
Pipework in the main refrigerating engine-room—an example of good craftsmanship.

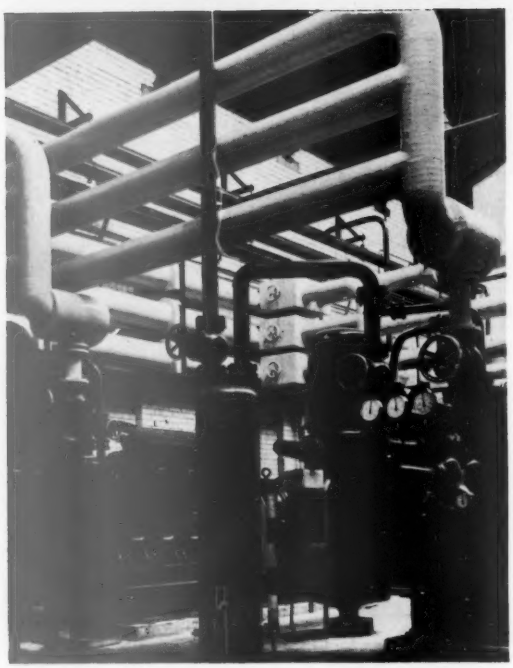


Refrigeration

Refrigerating compressors of the monobloc type are widely used in the manufacture and storage of foodstuffs. This installation comprises four 8″ x 8″ quad and an 8″ x 8″ twin monobloc compressor, driven by a total of 675 h.p., and have an installed capacity of 6½ million B.t.u. per hour. It is installed at the margarine plant of the Co-operative Wholesale Society at Irlam, Manchester. The equipment manufactured by J. & E. Hall ranges from small refrigerated cabinets and compressors of ¼ h.p. to centrifugal compressors of the largest size in use today.

J. & E. HALL LIMITED
DARTFORD · KENT





The air flow is horizontal across the trays returning to the back of the cooler.

The coolers operate on the fully-flooded ammonia pump circulation system and one common surge drum is used as an accumulator for the ammonia liquid. The flow of liquid into the system is controlled by a low pressure float regulator.

The condenser for the plant is a forced draught evaporative type mounted out of doors at roof level.

A large liquid receiver forms part of the installation.

Three 6 VQC compound ammonia compressors of L. Sterne & Co., Limited's manufacture provide the refrigeration for this section, each being complete with liquid injection inter-cooler and oil separator and driven by a 200 h.p. motor.

The operating temperature is – 35° F.

Plate Freezers

There are six Williams contact plate freezers and allowance has been made in sizing the refrigeration plant for the addition of two more freezers at a later date.

Near-surrealism achieved by the refrigeration specialist.

The freezers are fifteen station models, each station having an area of about 3,000 sq. in. and capable of handling peas at the rate of approximately 650 lb. per hour, at an evaporating temperature of – 35° F.

The freezers are connected to a common ammonia system and a 48 in. dia. surge drum is mounted beside the freezers, each freezer being supplied with ammonia by its own liquid pump. Each pump is complete with a pressure gauge and a pressure relief valve. The valve relieves at a pressure of 25 lb. per sq. in. back into the suction side of the system.

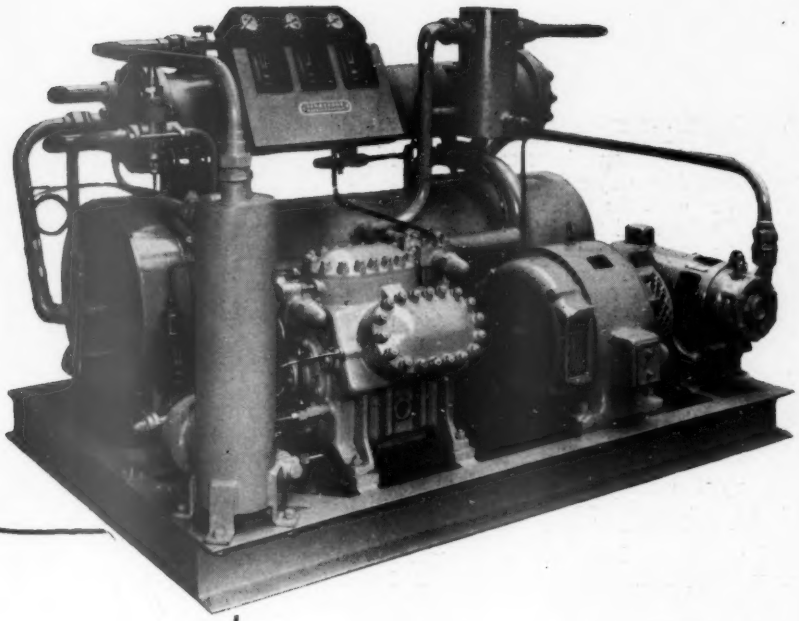
The six pumps are provided with a common oil sealing arrangement consisting of an oil reservoir with feed pump and isolating stop valves.

The flow of refrigerant to the surge drum is controlled by a low pressure float regulator.

Two forced draught condensers are mounted in a common water collecting tray at roof level. The water tray is large enough to accommodate a third condenser at a later date.

A common liquid receiver of approximately 1,000 lb. storage capacity is mounted beside the condensers.

Three 4 VQC compound ammonia compressors of L. Sterne & Company Limited's manufacture



NEW

PACKAGED WATER CHILLER

We illustrate our 10 horse power packaged water chiller which is being exhibited at the Brussels World Exhibition 1958.

This unit is the smallest of an entirely new range of packaged water chillers which are available in graduated capacities up to 100 horsepower.

Complete and ready for connecting to water and electrical supplies, why not save time, money and above all space by specifying Lightfoot Packaged Water Chillers ?

The Engineering Centre Group Stand
BLOCK C
BRITISH INDUSTRIES PAVILION

by **LIGHTFOOT REFRIGERATION**

leaders in specialised installations for over 70 years

THE LIGHTFOOT REFRIGERATION CO. LTD., ABBEYDALE ROAD, WEMBLEY, MIDDLESEX

provide the refrigeration, each being complete with liquid injection inter-coolers and oil separator and driven by a 130 h.p. motor.

Allowance has been made for a fourth compressor to be installed at a later date to bring the refrigeration duty up to 100 tons refrigeration or 1,200,000 B.t.u. per hour.

The freezers are defrosted by hot gas which is led into each freezer return header and passes via the liquid header into the surge drum.

The freezing tunnel has a capacity of 28 tons refrigeration or approximately 335,000 B.t.u. per hour at −35° F. The compressor is driven by a 100 h.p. motor.

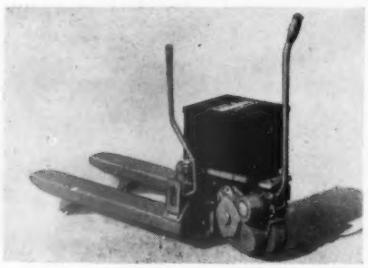
The remainder of the refrigeration plant is serving a Winchester froster, cold room and a chill room, requiring a total of 175 h.p.

The froster is run at a temperature of about 20° F., the cold room at −20° F. and the chill room at 30° F.

The two rooms are maintained at the required temperatures by means of plain pipe grids.

ELECTRICALLY-OPERATED TRUCK

AN ingeniously designed, extremely compact, and easily handled pedestrian, electric battery, pallet truck has been marketed by Wessex Industries (Poole) Ltd. It is fitted with manual- or power-operated hydraulic pump and rim and with



the power unit completely enclosed—comprised in one small fabricated housing, carrying the motor with automatic brake on the armature, reduction gearing, conroller, three-stud ball-bearing wheel hub, taper roller-bearing steering head, driving a detachable 10 by 3 bonded solid rubber-tyred wheel.

This unit is offered in a variety of small chassis and body designs suitable for 10-cwt. loading, for use in confined spaces, upper floors, gangways, lifts, etc.

The complete power unit, with controls and drive, can be supplied separately if required in such form.

The pallet forks are available in alternative lengths and widths to suit British Standard or special pallets.

The Exide traction battery is 12 volt, 87 amp. hour, in quickly detachable steel case, with charging socket, while a Westinghouse type VZ 6/10 charger is fitted.

A new company, **Hornitex (Plastics) Limited,** registered address 37/38 Fenchurch Street, London, E.C.3., has been formed with the object of marketing " Hornitex " in the United Kingdom and Eire; this arrangement takes effect forthwith. " Hornitex " is the well-known Melamine-surfaced hardboard produced in 35 gleaming colours and designs and is odourless. Hornitex (Plastics) Limited have also made arrangements to market the " Klipiton " fixing system which is now available in both aluminium and PVC in a variety of colours. All enquiries should be addressed to: Hornitex (Plastics) Limited. (Telephone No. MANsion House 6599.)

OBITUARY

Mr. Harry S. Broom

WE regret to record that Mr. Harry S. Broom died last month. He was the founder of Broom & Wade Ltd., of High Wycombe, and was largely responsible for the development of this firm to its present high position in the engineering world. Early in his business career he obtained a position in the works of Davey, Paxman & Co. Ltd., where he met his future partner and collaborator, Jethro Wade. He also held a position with the Linde British Refrigerating Co. When still only 20 years of age, he constructed a refrigerating plant which led him to make a detailed study of compressed-air problems.

At one time, Mr. Broom held an agency for the Hyatt Roller Bearing Co. and this was followed by his becoming a director of Vauxhall Motors Ltd., Delco Remy and Hyatt, and Frigidaire.

Spanish Fridge Maker.—The Spanish aircraft manufacturers, La Hispano Aviacion S.A., are to start producing refrigerators as part of a manufacturing expansion programme. Previously the company made only warplanes.

Scientific Meetings of Commissions 3, 4 and 5 of the International Institute of Refrigeration were held last month in the Russian Capital

★ MOCKBA, 1958

THE International Institute of Refrigeration has been to Moscow, for the first time. Russia became a member of the I.I.R. just before the Paris Congress in 1955 and readers of the annexes to the *Bulletin*, giving accounts of the meetings of the scientific commissions since then, will have noted an increasing Russian participation in the affairs of the Institute and in the scientific discussions.

This year, from September 1 to 10, the U.S.S.R. was the host country for joint meetings of the three commissions concerned with the storage of animal produce, either in the laboratory, in commercial practice, or as engineers responsible for design of equipment. We know very little about Russian progress in this field ; and we are glad to be able to report to our readers a little of what the delegates to the meetings saw and heard.

Twenty-two countries took part in the meetings, which were attended by 350 delegates, 150 from outside Russia. There were additionally a large number of Russian observers (cold store managers, etc.) who profited by listening to the papers and discussions. There was a large British contingent, 12 in all, but we regret that British science and technology were not more fully presented in the papers read to the meeting. From a total of 75 reports, the U.K. contributed only five. Naturally, the U.S.S.R. was the highest contributor, with 27 papers, but France produced more than three times as many as we did. Although the main theme of the congress was the storage of meat, we did not contribute one paper on this subject ; is this the best we can do, from a country in which most of the fundamental work has been done ?

It is fair to say that this comment is not one which was made by any of the foreign delegates, and indeed our prestige in the Institute is undoubted, since so many members of the British Institute of Refrigeration hold offices in the commissions. But we must do better at Copenhagen in 1959.

We do not propose to summarize the papers read to the meetings. The full list of these is given in an appendix, and all will be available, with the discussions, in an annexe to the *Bulletin*, as soon as the hard-worked secretaries of commissions can complete their task. The list shows the wide range of topics discussed within the framework of the general theme, but cannot show the exceptionally high standard of the contributions. It was generally remarked that never before had such a high standard been attained so consistently. Thanks to the excellent organization, ample time was available for exhaustive discussion, which was aided by the full texts of papers being available well in advance of the meetings.

The scientific discussions began on September 3, when the meetings were opened by M. Pavlov, The Minister for Trade. This day was spent by all three commissions in plenary session, discussing the seven papers on freezing of foodstuffs given in section 1 of the appendix. The chairman of the meeting was Dr. F. C. Fidler, of the Ditton Laboratory of the D.S.I.R., a frequent contributor to our pages. One important decision was to set up a working party to define exactly what is meant by " quick-freezing "

and to define and recommend "freezing time." This committee will comprise all interested parties, and its recommendations will be awaited by all concerned with this trade, where nomenclature to-day is chaotic.

The joint session of commissions 3 and 5, to discuss equipment, especially automatic equipment for cold stores, was held on September 4, presided over jointly by Professor Glansdorff (Belgium), well known for his work on test and safety codes, and M. Verlot of the French Railways.

Separate sessions of commission 4, presided over by Professor Kuprianoff of Germany, were held on September

4—6, on freezing of fish and meat, and the use of antibiotics as adjuncts to their preservation. Probably the facts which struck the "western" group most were the very large extent of Russian installations, especially at sea, for freezing of fish, and the up-to-date equipment used for this purpose. Russia freezes more fish at sea than any other country, and comes second only to Japan in the total quantity of fish frozen annually. We hope to give a fuller account of this aspect of Russian progress in a future issue.

Commissions 3 (Glansdorff) and 5 (Verlot) held meetings separately on September 5 and 6, discussing expanded surface coolers, automation, freezing tunnels and commercial freezing installations.

While the conference proper began on September 3, the earlier part of the week was taken up by meetings of the technical board, presided over by Dr. Fidler. This is the main technical organ of the I.I.R., where all the presidents, vice-presidents, and secretaries of the nine commissions meet annually to report on the year's work and to decide on priorities for future work. This year much of the time was devoted to discussions of topics for the Xth Congress in Copenhagen next August. Consideration was also given to regulating the work of special groups, set up to give answers to pressing questions in the industry. It is a measure of the increasing importance of the I.I.R. that the board was able to recommend the appointment of an engineer as assistant to M. R. Thevenot, the very able and distinguished director of the Institute. Attendance at these meetings was a record, thanks to the generous assistance given by the Government of the U.S.S.R.

A very full list of technical visits was included in the programme. Unfortunately, space precludes discussion of all the interesting things seen, but the following were visited by all delegates (this was possible because all visits were repeated, at least once) :—

1. V.N.I.K.H.I. The Scientific Research Institute for the refrigeration industry. This well staffed and excellently

Top left: In the Kremlin—Mr. W. S. Douglas (U.K.), Mr. G. H. L. Bird (U.K.), Mr. J. Conan (France) and Mr. D. Rutov (U.S.S.R.). Top right: At the Refrigeration Industries Research Institute (V.N.I.K.H.I.). Mr. M. Dradon (Belgium) and Prof. P. Glansdorff (Belgium) interested in compressors, and Dr. Orshan (Israel) and Prof. Kayan (U.S.A.), examining expanded surface cooler. Left: At Archangelskoe: Left to right: Mr. and Mrs. Kobulashvili (U.S.S.R.) and Prof. and Mrs. R. Plank (Germany). Below: Also at Archangelskoe: Groups of Russian delegates (in light coat—Mr. D. Rutov).

equipped laboratory deals with every type of problem, and works closely with institutes specializing in different foodstuffs, design of equipment, and in design of large cold stores. It has a range of constant temperature rooms, halls for study of mechanical and absorption machinery,

as well as engineering, electronic, biological, microbiological and biochemical laboratories.

2. The Scientific Research Institute for the meat industry. Problems studied include laboratory, field plant, and full scale work on freezing of carcases, freezing of meat in blocks, mechanization of abattoirs, by-products utilisation (including preparation of plasma from bovine blood).

3. Mikoyan combined plant. This plant has cold storage rooms, a dry-ice plant (CO_2 derived from burning fuel gas), and an ice cream plant. Here the machinery is modern, easily kept clean, and well run and supervised (by one of the many women we saw in charge of production or research). The products are excellent, and contain no vegetable fats or any animal fat other than butter.

4. The "Compressor Plant." Machines produced here are not of the most modern design, but when it is remembered how vast is the U.S.S.R. and relatively inaccessible some of the sites are, it is apparent that the primary need is for simplicity of operation and servicing. Machines are made for all modern refrigerants, and designs include one running at 960 r.p.m. with 2, 4 or 8 cylinders of 150 mm bore and 130 stroke for ammonia or F22. Interchangeable cylinders are available for other "Freons." The design is by the Central Bureau for Refrigeration Machinery.

5. Likhachev Automobile Works; household refrigerator shop. One of 9 plants producing household cabinets, the total output of which is 400,000 per year. Sizes range from 45 to 250 litres (2 to 9 c.ft.), and prices from 650 to 2,200 roubles (perhaps from the monthly wage of an unskilled operative to that of a medium grade research scientist).

6. Dairy plant "Ostankino." A modern plant, with interesting automatic handling, cleaning and return to the filling line of complete baskets of bottles. (Some information on the dairy industry is given in the recent "annexe" to the *Bulletin*, describing the meetings of commission 4 at Interlaken in 1957.)

7. The permanent agricultural and engineering exhibition. A vast park, with pavilions in the style of every republic in the Union, showing the produce, the activities of the people, and progress in engineering and science.

8. Moscow University. This vast edifice (one phrase of the guide was "45 kilometres of corridors"!) is overwhelming—refrigeration-ly speaking (!). The main feature is the steam jet plant for cooling water for the air-conditioning plant. This comprises four machines; each of 1,250,000 B.t.u. per hour, using 1·8 tons of steam per hour, and cooling water to 34°F. They are fully automatic, but of relatively low (21 per cent.) efficiency.

9. Cold Store No. 12. We have had much theoretical discussion of jacketed stores, automation in the engine room, etc., but this is a large commercial store, fully jacketed, with electronic control of machinery and a host of interesting features, such as the use of radio isotopes as level detectors and controllers in receivers.

But the Russians surely have a proverb that "all work and no play" isn't any good for Ivan either. The ladies, of course, were well cared for, with their own programme of visits largely with a feminine slant, including a fashion parade.

Mrs. Moiseva took care of them and quickly became "Natalie Andreiovna" to many new friends.

Visits in which most participated were to the Tretiakov picture gallery, the palaces of Archangelskoe and Ostankino, the fabulous Kremlin (with its host of cathedrals and priceless collection of jewels), the Lenin-Stalin Mausoleum, Gum (the big department store), the monastery town of Zagorsk, the Lenin Stadium and to several amusements, including the Obratzov puppet-theatre, the Cinerama film "How vast is my country" (currently showing at Expo 58 in Brussels) and the Opera.

At all these, delegates were the guests of the Russians. The treatment accorded to everyone was characterized by consideration, friendliness and efficiency. Consideration in that those invited as guests were asked to arrive some days before the meeting began, to rest after the long journey (brief in the TU 104); friendly in that all that could be done for one's comfort was done, and efficient in that the entire programme of meetings and excursions went off without one hitch.

To one who did not previously know Russia (and who must remember to say "the U.S.S.R." since "Russia" is but one state in the Union), the most striking thing is the friendliness of the people; in the Metro a request for direction is answered by being accompanied all the way to the train, and not by a curt reply.

Moscow itself is a city of tremendously wide boulevards or "prospects," with gigantic new office and hotel blocks and miles of new flats going up, not only on the outskirts, but also replacing the old wooden houses, many of which remain, but which are rapidly disappearing.

Meetings such as these involve months of preparation, much expense and a large staff of secretaries, interpreters and guides. Indeed the members of the Russian organizing committee have had no holiday this year, in their determination to make the conference a success. This it was so, in a resounding fashion, is largely due to the efforts of Mr. S. Kobulashvili, chairman of the organizing committee, to his committee, and to the Ministry of Trade. This was a refrigeration occasion to remember.

U.S. AND U.K. FRIDGES

British housewives need no longer dream enviously of American refrigerators. As far as appearance and fittings are concerned they are no better than the modern British models. That is the opinion of Miss Mary George, M.B.E., director of the Electrical Association for Women, who has just returned from a visit to the United States. Two main features which impressed Miss George during her visit were that almost every home in America had a refrigerator and the most popular size model was about 13 c.ft. This shows a marked contrast with Britain where only just over 10 per cent. of our houses have refrigerators and the biggest demand is for models up to 5 c.ft. Main reasons for this contrast is that there are still certain restrictions on sales in this country in the form of purchase tax and hire purchase regulations. Another big factor in determining the size of refrigerator bought is the lack of space in British kitchens.

BOOK REVIEW

Lehrbriefe Fuer Kaltetechnik. (Educational booklets on technical refrigeration) nos. 1–5. 8¼ in. × 5¾ in. Loose leaf. Published by C. F. Mueller, Karlsruhe. Price DM. 7.70.

A series of educational booklets dealing with a subject with which the refrigeration service engineer or operator should be acquainted. About 20 booklets are envisaged of which five have already appeared; these deal respectively with mathematics, physics, technical refrigeration, electrotechnics and cold storage and are each of about twenty pages. Basic data on each subject is given, some of which include the simple facts of a first approach to a subject, which are nevetheless valuable as a refresher; these lead up to the standard required by a skilled serviceman or operative of small and medium refrigeration sets. A semi-stiff cover is provided.

Mr. Eugene Ruddin, C.B.E., third from left, the President with, on his right, the chief guest Sir Rupert De la Bère, Bart., K.C.V.O., and beyond Mr. Kenneth Lightfoot, O.B.E. On Mr. Ruddin's left is Mr. J. Mackenzie, President, Scottish Association of C.S. & I. Trades.

"Government Must Keep Pledge on Cold Stores"—

N.F.C.S.I.T. President

THE annual luncheon of the National Federation of Cold Storage and Ice Trades at Criterion in Piccadilly last month was made the occasion by the president, Mr. Eugene Ruddin, C.B.E., for a pointed reminder to the Government that they must not break faith with the industry over the national cold stores.

Chief guest at the luncheon was Sir Rupert De la Bère, Bart., K.C.V.O., president of The Institute of Refrigeration who proposed the toast of "The Federation" in his own, delightful, inimitable style.

Supporting the president on the "top table" were Mr. Kenneth Lightfoot, O.B.E., past-president, Mr. F. S. Beckett, Mr. F. Davison, Mr. F. H. Hunt, Mr. H. G. Jaeger, and G. E. Tonge of the Federation. Mr. D. T. Lee, secretary, was, of course, present.

Guests included Mr. A. S. Alexander and Mr. W. Mitchell, of the National Association of Quick-Frozen Food Processors, Mr. N. O. Quibell and Mr. H. B. Sheasby, O.B.E., of N.A.W.D.O.F.F., Mr. R. G. Bundey, Mr. W. S. Douglas, Mr. A. D. Hillhouse, O.B.E., Mr. E. P. Keely, C.B.E., Mr. James MacKenzie and Mr. Kenneth Walker of the Scottish Association of Cold Storage & Ice Trades, Mr. G. A. May, O.B.E., of the National Cold Stores (Management) Ltd., and Mr. J. A. Robertson, O.B.E.

In his reply to the toast of "The Federation" Mr. Ruddin said in part: "Sir Rupert has spoken of important aspects of refrigeration in a general way, and he has dealt with the brighter side of the future, and quite obviously the expansion of refrigeration goes hand in hand with the growth of civilization. I am sorry to say that from more or less the immediate view point there has been a darkening of nearby clouds, and it is unfortunate that it is about this I am compelled to speak. It is unfortunate because we have many guests with us today and we do not wish to be churlish in our hospitality by wearying them with our problems. Nevertheless, this is an official lunch and I do, therefore, ask their forbearance for having to speak about the relationship between the Government and the industry, as represented by this Federation and its affiliated associations.

"I am sorry that in doing this I must to a great extent reiterate certain points that I made at a lunch similar to this some two years ago, when I gave a history in regard to the building programme that was entered into by the Government, when in 1939 or thereabouts, because of the inadequate volume of cold storage space associated with the possibility of an approaching war the Government were committed to build some 47 cold stores of a total capacity of some 17,000,000 c. ft., which increase today represents about one-third of the effective total storage space in the country.

"Up to that time cold storage accommodation had been 50 per cent. in excess of that required to meet the day to day needs of the nation and the Government in order to make quite sure that after the war there was no indiscriminate releasing upon the market of Government cold stores, so bringing about untold chaos within the industry, wisely considered it proper and, in fact, moral to give certain undertakings to this industry.

"It would appear, that the Government are seeking to question the validity of the pledges and in regard to this I must refer to what has been said in the House of Commons,

Left group: Mr. E. J. Waldron, Mr. G. A. May, O.B.E., and Mr. E. R. Lawrence. Centre group: Mr. B. S. Murray and Mr. H. G. Jaeger, Right group: Mr. W. S. Douglas and Mr. S. L. Maunder.

Left group: Mr. A. E. Kittle, Mr. F. L. Banting, Mr. H. E. Bickle, Mr. C. B. Davies and Mr. S. Hearne. Right group: Mr. J. Greenwood, Mr. C. M. Wakelam, Mr. L. C. Conway and Mr. J. C. Middleton.

in the first instance by the Parliamentary Secretary to the Minister, Dr. Charles Hill, on November 23, 1954 :—

" 'The pledges were subsequently repeated before the instrumentation of control in March 1941, *by my noble Friend*, Lord Woolton, then Minister of Food. He was speaking for the Coalition Government of the day in reaffirming the pledges that were given. The hon. Member for Cardiff, West, said that in public life promises must be honoured. He then went on to refer to changed circumstances and a new atmosphere and the like.'

And again,

" 'I want to put this matter on a temperate and reasonable basis, and I submit that it is essential that such a pledge given to an industry should be honoured, however inconvenient it may now be in the view of many.'

" Continuing, the Parliamentary Secretary said :—

" 'The Government have taken the view that the pledge given incidentally by a Coalition Government should now be honoured, even though it may be difficult and inconvenient to do so, and that the fact of difficulty or inconvenience should make no difference to our determination to honour it.'

" We are therefore entitled to expect the Government, outside political dogma, to appreciate that it has also a serious responsibility to this industry—it is an industry which is without doubt of national importance.

" I must ask therefore that fresh thought is given to this matter and that the Counsels of wisdom and honour prevail," concluded Mr. Ruddin.

Mr. F. H. Hunt and Mr. F. W. Pengelly.

Mr. J. A. Robertson, O.B.E., Mr. J. Mackenzie and Mr. K. Walker.

Left to right: Mr. R. A. Barrel, Mr. T. D. Carnwath, Mr. M. Costa, M.B.E., Mr. T. Howard and Mr. E. A. Tappenden.

Left group: Mr. H. B. Sheasby, O.B.E., Mr. W. Mitchell, Mr. A. S. Alexander and Mr. N. O. Quibell. Right group: Mr. H. Boyd, Mr. G. W. Strang, Mr. G. W. Foster and Mr. J. A. Howie.

The "gas storage season" has begun—which gives added point to this contribution from "Ditton Lab."

The Use of Ethanolamine in Scrubbers for Fruit Stores

By G. MANN, Ditton Laboratory, Department of Scientific and Industrial Research

MANY varieties of apple and pear can be stored for longer periods in a modified atmosphere than in air; for example, Bramley's Seedling can be stored longer in an atmosphere containing 8 to 10% carbon dioxide and 13 to 11% oxygen than in air, and Cox's Orange Pippin longer in 5% carbon dioxide and 3% oxygen than in air. A reduction of oxygen to 3 to 5% is probably advantageous in the storage of all fruits and vegetables though storage at concentrations of oxygen below 3% may cause damage. An increase in carbon dioxide up to 5 to 10% is advantageous for the storage of a wide variety of fruits and vegetables. A few may be damaged by storage in concentrations of carbon dioxide as low as 5% but some are not damaged in concentrations well in excess of 10%. The best concentration of oxygen and carbon dioxide at which to store any particular variety of fruit can be determined only by storage trials. Once the best conditions for storage have been established the most practical means of achieving them can be decided.

When fruit is stored in a gas-tight store the composition of the air is changed by the respiration of the fruit; oxygen is absorbed by the fruit and carbon dioxide is produced by the fruit in practically equal volumes.

Hence when fruit is present the air in a gas-tight store will be changed in composition. As the concentration of carbon dioxide rises to 5, 10 or 15%, the oxygen concentration will fall to 16, 11 or 6%, the sum of the carbon dioxide and oxygen concentrations remaining approximately 21%, *i.e.* the value of the original oxygen content. Hence, by restricted ventilation, atmospheres of 10% carbon dioxide and 11% oxygen can be obtained, *i.e.* conditions suited to some varieties. Atmospheres low in oxygen and in carbon dioxide cannot be obtained by restricted ventilation alone. However, by absorbing the carbon dioxide as it is produced, atmospheres low in oxygen and carbon dioxide can be obtained. Absorption can be effected by " scrubbing," *i.e.* passing air from the store through a chemical absorbent.

The main requirements for successful " scrubbing " of fruit stores are that the scrubbing medium is inexpensive and does not give off volatile products likely to damage the stored produce, and that the plant can be operated by unskilled labour, *i.e.* that it is simple in design and operation and occupies a small space only.

The chemicals used for this process have hitherto been an aqueous solution of caustic soda or milk of lime. While these chemicals are satisfactory for absorbing carbon dioxide they are expendable and frequent recharging of the scrubber is necessary; provision must also be made for disposing of the spent liquor.

With a view to simplifying the scrubbing process investigations have been made into the possibility of using a method of absorbing carbon dioxide which is used extensively in the oil refinery industry [1, 2, 3, 4.] In this method carbon dioxide in the store air is removed by absorption in a solution, which can then be regenerated by heating and driving off the carbon dioxide. The chemicals which are used are aqueous solutions of ethanolamine (mono; di; and tri). Pure ethanolamine can be used provided its temperature does not fall below 60° F.; at this temperature it is extremely viscous and air could be circulated through it only with difficulty.

In considering the use of ethanolamine in scrubbers for fruit stores it was first necessary to establish whether these chemicals were likely

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to have a harmful effect on the fruit. Tests showed that the fruit suffered no apparent injury by exposure to the vapour of these substances.

The next step was to find out which of these chemicals was likely to be the most efficient in removing carbon dioxide and could be regenerated with minimum consumption of electrical energy. A study of published data indicated that the choice lay between solutions of mono- or tri-ethanolamine.

The amount of carbon dioxide a solution can take up can be calculated from chemical equivalents but this assumes that the solution is worked between the maximum and minimum pH values. However, in practice the efficiency of absorption falls off as the pH falls with the amount of carbon dioxide absorbed; further, it is not always possible to regenerate to the maximum pH value as the rate of release of carbon dioxide from the solution slows up as the amount in solution is decreased. Again the rate of regeneration of the solution is dependent on temperature, and the higher the temperature to which the solution is raised the more easily is carbon dioxide released. It follows therefore that very quick regeneration can only be obtained at the expense of a heavy electrical heating loading which may not be economical or easy to apply.

A test rig was set up and a series of experiments carried out with solutions of mono- and tri-ethanolamine. From preliminary work on these solutions it appeared that mono-ethanolamine was the more efficient as an absorbent though perhaps a little more difficult to regenerate. Fig. 1 shows graphically the performance curves of the same unit operating under the same conditions of air flow and gas concentration for each of these two absorbents. A larger unit was then constructed and further tests were made using mono-ethanolamine as the absorbent.

The results indicated that for about five cubic feet of carbon dioxide absorbed by the solution, approximately 1 kw. of electrical energy as heat was required for subsequent regeneration. There is no doubt that with use, methods of reducing this electrical energy consumption will suggest themselves. We are, however, only concerned with the possibility of practical application of the method; the development of the design of apparatus and methods of regeneration can be left to the firms manufacturing the apparatus. One such apparatus has already been described[5].

The design of a unit which was tested was basically the same as for one using caustic or milk of lime as the absorbent. Examples are shown in fig. 2.

The most common size of storage chamber used for gas storage has a capacity of about 50 tons of fruit. Assuming a maximum carbon dioxide respiration rate of 4 cubic feet per ton per day it would be necessary to remove 200 cubic feet of carbon dioxide per day. Assuming an average scrubbing efficiency of approximately 30% and a store carbon dioxide concentration of 5% about 500 cubic feet of store air would have to be circulated through the scrubber unit per hour.

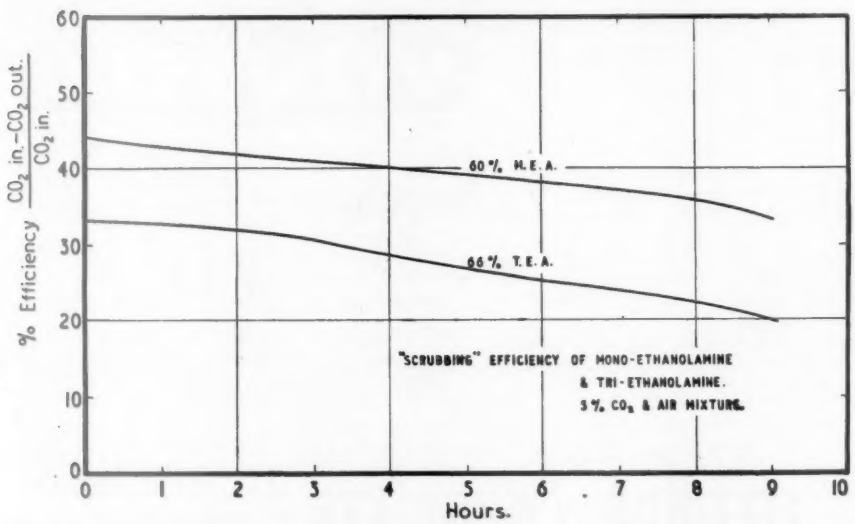


Fig. 1.—The efficiency with which carbon dioxide was absorbed by mono-ethanolamine (M.E.A.) and by tri-ethanolamine (T.E.A.) under similar conditions in an experiment unit.

Two methods of arranging the scrubber unit are possible, namely:—

(1) having two identical units, one in use absorbing carbon dioxide while the other is being regenerated or,

(2) arranging some system whereby absorption and regeneration take place at the same time and continuously.

For method (1), the capacity of the units should be sufficient to absorb the carbon dioxide output for one day and each unit is used alternately. It has been found in practice that to give a sufficient margin for eventualities it requires about 27/30 gallons of 60% mono-ethanolamine to absorb a day's output of carbon dioxide from a 50-ton store.

Having once obtained the necessary carbon dioxide concentration in a store it can easily be maintained either by regulating the quantity of air circulated by the blower by means of a stop valve or by stopping the blower periodically.

To regenerate the solution it is necessary to shut off the circulation of air through the unit, to open the vent cock, to switch on the heat and to raise the solution temperature to about 230° F., maintaining it at this level for an hour or so.

For method (2), one scrubber unit is provided having sufficient solution capacity to provide for one day's absorption of carbon dioxide produced by the produce. Adjacent to this unit and connected to it (at upper and lower levels) by pipes is an electrically heated container provided with a vent pipe. While scrubbing is going on regeneration takes place simultaneously in the heated container with the solution circulating by thermo-syphon between the absorption and regenerating units.

The amount of heating necessary will depend on the way in which the units are operated but it is advisable to provide for 4 kw. of heating so divided that it may be controlled as required.

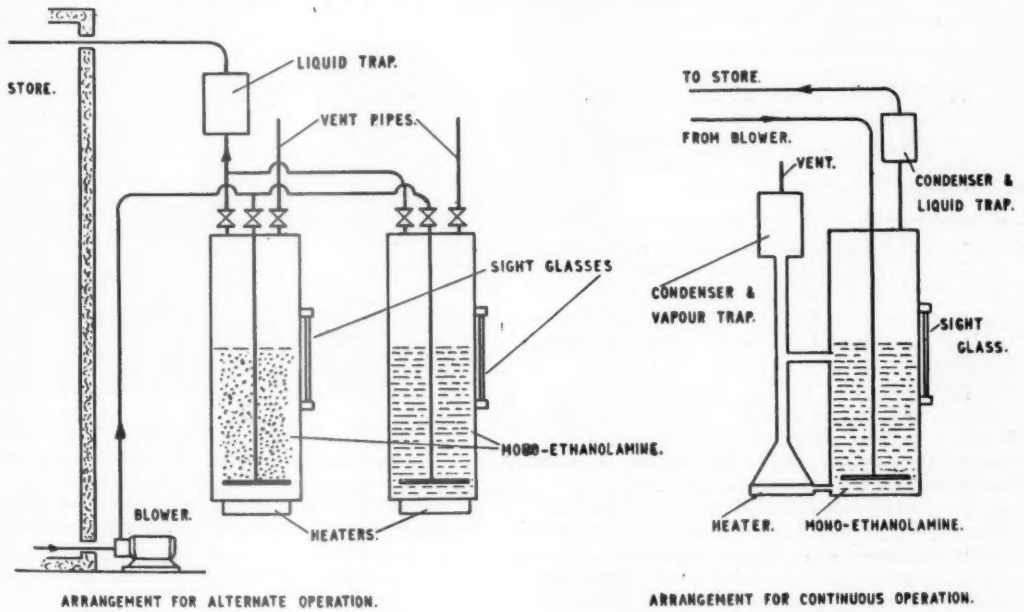
A depth of solution between 24 in. and 30 in. has been found satisfactory for the efficiencies and the rate of air flow already quoted.

To prevent loss of solution by carry-over in the air stream a liquid trap in the return line is necessary; this may also act as a cooler for the returning air.

With scheme (2), some advantage is obtained by arranging for a heat exchanger so that air returning to the store is cooled by the air which is being drawn from the store by the blower.

Owing to a slight carry-over of vapour in the air stream from the scrubber it will be of advantage to fit a sight glass, a connection for topping up the level of the solution. In the construction

Fig. 2.—Diagrams showing possible arrangements of ethanolamine "scrubber" units.



ARRANGEMENT FOR ALTERNATE OPERATION.

ARRANGEMENT FOR CONTINUOUS OPERATION.

of scrubbing units using ethanolamine solutions non-ferrous metals should not be used.

Summary

Experiments have shown that mono- and triethanolamine can be used as an absorbent for removing carbon dioxide from gas stores. Possible methods of using this in practice are suggested.

The work described in this paper was carried out as part of the programme of the Food Investigation Organization of the Department of Scientific and Industrial Research.

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REFRIGERATED RAIL TRANSPORT IN EUROPE

ALMOST tastefully produced publication on Interfrigo has been issued by that organization whose full title is Société Ferroviaire Internationale de Transports Frigorifiques.

The purpose and activities of this international refrigerated wagon service is fully explained in these pages. The extent of Interfrigo operations, which began in 1951, is now very wide indeed as can be judged by the interesting map of Europe included.

Enumeration of the different operations which form this cold service shows the importance of a proper use of specialized material. It also demonstrates the importance for the user of having in service wagons which reduce as much as possible the number of operations in transit and of expediting those operations which are indispensable.

It is with this in mind that the new wagons which INTERFRIGO have made available to the customers from 1957 onwards have been planned.

These wagons offer especially : —

— a loading area (237 sq.ft.) and a loading capacity (1,554 c.ft.) far superior to the average of the older vehicles, which permits heavier and better composed consignments ;

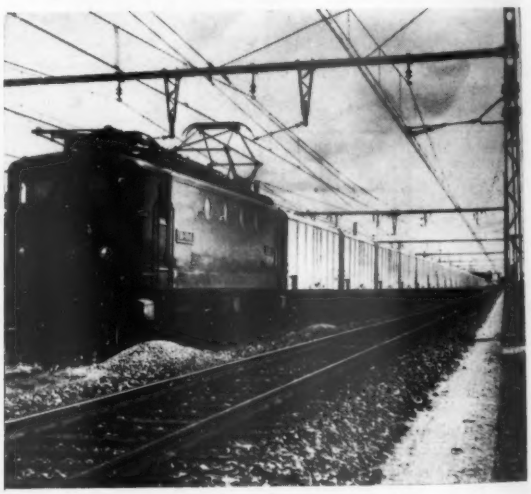
— an insulation perfectly designed, whereby points of heat loss have been carefully eliminated ;

— an ice capacity of 3,6 tons, whereas the oldest largest ice-bunkers cannot hold more than 2,8 to 3 tons. The re-icings, which cause delays and expense, can in this way be reduced or eliminated on numerous itineraries ;

— position of the ice-hatches which permits easy hand as well as mechanical loading of the ice ;

— complete metal covering, outside as well as inside, whereby the insulation is well protected and the insulating qualities are maintained, which offers a neat and easily washable loading-space, similar to the " all metal " wagons of the German Federal Railway, which for that reason are much appreciated by the customer ;

— meathooks numbering 256 at a height of 6 ft. 1 in. above the gratings which are also metal and constructed in such a way as to assure an excellent air circulation.



The majority of these wagons are moreover fitted with electric ventilators which assure an efficacious cooling and enable the merchandise in the vehicle to be pre-cooled in an easy way simply by connecting the electric installation with the industrial current.

Such a wagon has been on view at the Brussels International Exhibition.

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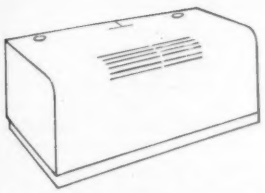
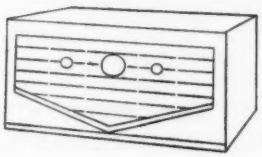


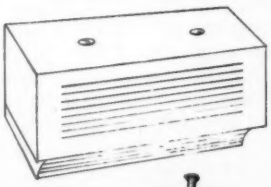
Model S2T16, ½ H.P. Motor Compressor, single cylinder



A full range of hermetically sealed motor compressors with motors suitable for Three Phase and also Single Phase electric supply, manufactured under an exclusive licence from Tecumseh Products Company, U.S.A. is available for air conditioning engineers and manufacturers of room air conditioners.

Complete forced feed lubrication, dynamic balance of reciprocating parts and chemical treatment of all bearing surfaces are a few of the outstanding construction features of these compressors as well as all Sternetic Hermetics. They are admirably suited for air conditioning unit coolers of either the window or console type. When used in conjunction with adequate condenser surface and a well designed low side, the compressors are unsurpassed in performance.

The ½ H.P. model S2T16 compressor is a single cylinder capacitor start type, an ideal combination of compactness and refrigeration capacity. With the same internal spring mounting as used in domestic compressors it provides the last word in quietness and efficiency at the lowest possible cost. Available with either low or high starting torque motor and suitable for use with Freon 12/Arcton 6.



Motor Compressors, twin cylinder. Model B7613, ¾ H.P.; Model B1616, 1 H.P. & Model B32T16, 1½ H.P.

The ¾ H.P. model B7613, 1 H.P. model B1616 and 1½ H.P. model B32T16 are twin cylinder capacitor start compressors having a combination internal resilient mount and external spring mount. The resulting smooth vibrationless operation makes these very suitable for room air conditioners. Dependability and high efficiency are features of these compressors. These models are available with low starting torque motors and are primarily designed for Freon 22/Arcton 4 refrigerant.

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TECUMSEH

Refrigeration Controls—10

By H. H. EGGINTON

(*Continued from September issue*)

THERMOSTATIC CONTROLS

IN the previous articles the action of pressure-operated controls has been described, based on the fact that the prime mover is a pressure-sensitive element, controlling by reason of the pressure from, or inherent in, the refrigeration system, *e.g.*, constant pressure expansion valves, water valves and pressure switches. Clearly, therefore, if a sealed system is attached to the prime mover of one of these controls, and such a system produces a specific pressure for a given temperature, then a pressure-operated control can be converted to a thermally-operated control, in other words, a thermostat. Since liquid refrigerants in pure form obey vapour pressure/temperature laws, *i.e.*, pressure is proportional to temperature, then they are an obvious choice to fill the sealed system to be attached to the prime mover to convert a pressure to thermostatic control.

The normal way of producing a sealed system is to attach a fine bore or capillary tube to the prime mover and at the opposite end, a bulb or phial. The refrigerant liquid is contained in the phial and, according to its temperature, gives a pressure which is transmitted to the prime mover. The valve or switch mechanism responds to the pressure in the prime mover, but is in fact responding to the temperature of the phial.

There are three principal types of charge for introduction into sealed systems to convert pressure-operated devices to thermostatic types:—

(1) Liquid charge (sometimes known as wet charge).

(2) Gas or limit charge (sometimes known as dry charge).

(3) Adsorber charge.

Liquid Charge

Such a charge is usually identified by the use of a relatively large phial, which contains liquid refrigerant. In any vapour-pressure-operated instrument the surface of separation between the vapour and liquid phase is the controlling point. It is the temperature of this surface which determines the pressure for the whole system and no other pressure can exist other than in a temporary form.

If an instrument is to be worked such that the power element and capillary are always colder than the phial, then the system can be charged so that the liquid fills the power element and capillary. The phial will contain a little liquid, but in the main refrigerant vapour, because it is the hottest point of the system. In this case the surface of separation is in the phial and control is maintained by the temperature of the phial.

Conversely, if the power element and capillary are always hotter than the phial, then the liquid is maintained in the phial with a little vapour space and the remainder of the system contains vapour. Here again, the control is maintained by the phial because it contains the surface or separation.

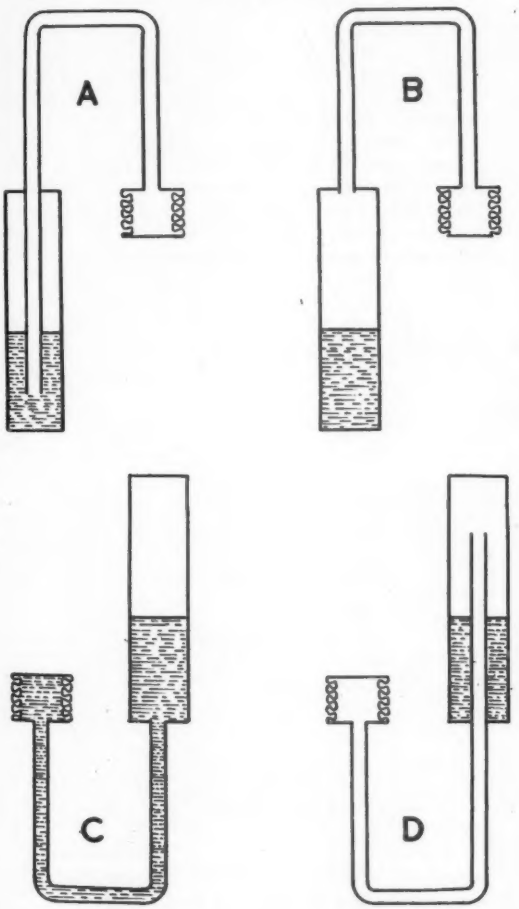
Unfortunately, in refrigeration work it is common for the relative temperatures of power element and phial to reverse. This causes what is known as reversal of the charge, *i.e.*, if an instrument is working with the phial colder than the power element, the liquid charge and surface of separation will be in the phial, but if the phial becomes hotter than the rest of the system, then the charge will boil off and condense in the power head and capillary. If insufficient charge or too small a phial is used, then when reversal takes place there will be an inadequate amount of liquid to fill the power element and capillary, yet leave some in the phial. In such a case the surface of separation between liquid and vapour will be in the power element or capillary and it will be the temperature of this point which will control. In other words, the temperature of the phial is no longer the controlling factor.

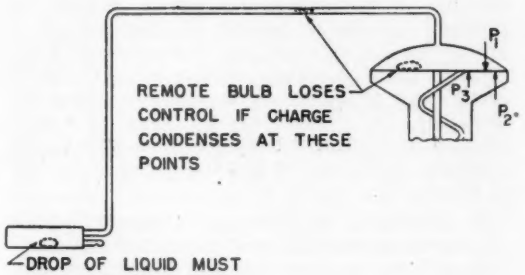
Where reversal of temperature is likely, therefore, it is essential that the phial be large enough

to contain all the liquid and some vapour space when it is the coldest point of the system. In addition the amount of liquid charged should be sufficient for the power element and capillary to be filled and yet leave some liquid in the phial. In this way control is maintained at the phial irrespective of reversal. Such a charge is sometimes known as a cross ambient charge (fig. 33).

If reversal conditions are likely to occur it is preferable that the capillary entering the phial should be so arranged that it is always covered by some liquid, irrespective of reversal of the charge. Some manufacturers lead capillary to the bottom of the phial, in which case, for reversal service the phial is best installed vertically with the capillary leaving the top. Other manufacturers only permit the capillary to enter the phial and in this instance, for reversal service, it is preferable to mount the phial vertically with the capillary leaving the bottom. It is possible, by using a very large phial, to have a reversal protection for any type of phial position, vertical (capillary either top or bottom) and horizontal, but such a large phial is difficult on some installations. If a more normal type of phial is used under conditions where reversal is not possible, then slightly improved sensitivity will result by having the capillary ending in the phial in the vapour zone, but under these conditions a gas-charged instrument can be used successfully.

Fig. 33.—Correct location of capillary tube end in a phial intended for vertical operation with capillary emerging from the top. (A) High Temperature Instrument. (B) Low Temperature Instrument. Correct location of capillary tube end in a phial intended for vertical operation with capillary emerging from the bottom. (C) High Temperature Instrument. (D) Low Temperature Instrument.





By courtesy Alco Valve Co., U.S.A.

Fig. 34.—Reversal with gas charge.

Gas Charge

In this type of charge a limited amount of liquid refrigerant is charged into the system, which becomes entirely dry vapour at some predetermined temperature. Hence the normal pressure/temperature relationship for the particular refrigerant exists until all the liquid phase is converted to dry vapour, and then the pressure/temperature relationship follows the superheated vapour characteristic which gives very much lower pressure change per unit of temperature change. In practice the system is charged with vapour under known pressure and temperature conditions so that the temperature at which wet vapour is formed is known and this is the point below which the system is thermally sensitive.

Gas-charged systems are very sensitive due to the fact that a low mass of phial and charge has to be changed in temperature to effect a pressure change. The danger with this system is that of

reversal, in which case the power element or capillary can easily contain the wet vapour or limited amount of liquid and hence control of the phial is lost, the surface of separation of liquid and vapour phase having moved away from the phial (fig. 34). Commonly the phial of a gas-charged instrument is simply a small part of the capillary which may be in straight form or coiled in some way.

In addition to the advantage of sensitivity, this type of charge can be used to protect the power element from excessive pressure at high temperature above the required control range, and its characteristic of not sensitively responding above a certain temperature can be exploited in thermostatic expansion valves.

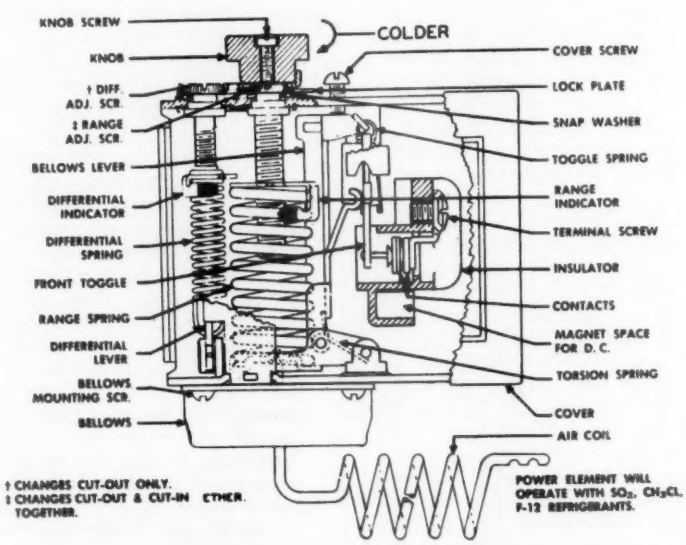
The feature of response rate is used in domestic refrigerator thermostats with the advantage of small phial and the reversal problem being non-existent with good installation.

The Adsorber Charge

Consists of a phial containing a solid adsorber substance such as activated charcoal and into the system is pressurized an inert gas, such as nitrogen, or in refrigeration temperature ranges, carbon dioxide. Pressure changes with temperature occur through the process of adsorption in which the adsorbent (activated carbon) takes up the adsorbate (inert gas), the amount of gas adsorbed increases as the temperature falls. Thus, the amount of "free" gas in the system is reduced at low temperatures and a lower pressure results. An increase in pressure results from increasing temperature by reversal of the adsorbing process.

The controlling factors in this type of charge are the total volumetric capacity of the system, the amount and type of adsorbent, the type and pressure at which the inert gas is introduced into the system, and the temperature at which pressurization is undertaken. By controlling these variables, pressure/temperature curves are obtained which are very similar to refrigerant vapour pressure/temperature curves.

The characteristics of the adsorber charge fall mid-way between the other two charges in so far as reversal cannot occur (the sensitive adsorbent being maintained in the phial) and extreme pressures are not normally produced at high temperatures. This charge is, however, somewhat slower in thermal response and can show a head sensitivity characteristic, that is, variations in power element temperature affecting the overall pressure and so giving erroneous response. This head sensitivity can, however, be reduced to negligible proportions with suitable design and control of the variable factors of volume, adsorbent mass etc. The adsorber charge is used



By courtesy Ranco Inc., U.S.A.

Fig. 35.—Typical commercial thermostat (compare fig. 30).

almost exclusively on thermostatic expansion valves.

Thermostatic Switches

Thermostatic switches are used where response to temperature is converted to on/off switching of electrical apparatus, such as compressor motors, fans, solenoid valves, heating circuits, etc. Bearing in mind that there is no modulation in switching electrical current—it is either on or off—particular attention has to be paid to the differential for each application. All thermostatic switches are designed to be thermally sensitive at the phial and at this point only, so that correct siting and good thermal contact with the medium or surface temperature being measured are essential. This type of control is divided into two broad types, the switch for the domestic refrigerator and the commercial and industrial application. The latter tend to be straightforward conversions of the pressure switch, but the former has developed into a highly specialized product and no longer resembles, although basically it is still, a pressure switch.

Principal Requirements

Because the thermostatic switch performs a similar duty to the pressure switch, the main requirements are the same (see previous article). There are, however, one or two exceptions and additions, in particular the working thermal range in terms of pressure is more comparable with the low pressure switch, and in some instances is less. In addition, and in conformity with this trend, differentials in terms of pressure are finer.

The principal additional requirements over and above the pressure switch are:—

(1) A size and shape of phial which must be amenable to installation and capable of good thermal response.

(2) Capillary tube to be small in diameter and flexible, yet having a bore to permit transmission of pressure of vapour or liquid without appreciable lag.

(3) Capable of withstanding field ambient temperatures without drift (note: this may be as high as 120° F. under certain transit condition, *e.g.*, shipping across the Equator).

(4) For finer differential controls a thermal range of approximately 30 to 40° F. This length of range should be applicable to high, medium and low temperature refrigeration.

(5) Differentials in the main in two groups 1 to 7° F. and 10 to 20° F.

Construction

The industrial and commercial control is usually identical with the pressure switch already described, except that field adjustment of the differential is sometimes not built into the instrument. It may exist as a factory adjustment by increasing or decreasing the toggle spring load in the snap action switch or by increasing or decreasing the amount of contact arm movement away from the contacts by an adjustable stop. In both instances differential is increased by increasing toggle spring load or contact arm movement because the prime mover has to do more work. Where field adjustment of differential is built in a thermostatic switch, then it follows the pattern described for pressure switches (fig. 35).

The domestic control utilizes the principles of the pressure switch but is usually a very much smaller instrument and commonly uses a diaphragm or bellows prime mover.

Outer case construction is metal, stainless steel or brass or phenolic type plastics. In some instances, the switch-carrying plastic components are in melamine materials which have a high resistance to electrical tracking, but phenolic mouldings or laminates are more common. Although screw threads are used for ranging devices by changing spring loads opposing the prime mover, cams are much more widely used. The use of temperature-graduated scales on the domestic switch is rare, and usually they have numbered scales with an angular knob rotation of less than 360° (Fig. 36).

As far as is known all domestic thermostats are gas charged, whereas the commercial and industrial type vary, some being liquid and some gas. A broad break down of this group, however, is that upper temperature or ambient range instruments are liquid charged, as are the medium temperature ranges. Low temperature types are usually gas charged because high pressure refrigerants are used and pressure protection is essential at elevated temperatures. At lower temperatures the chances of reversal conditions are extremely small, particularly with good switch and phial location, and hence gas charging is acceptable.

Operating Characteristics

The general principles of this control have already been explained, bearing in mind that normally refrigeration switches make circuit on rise in temperature and break on fall. Special purpose instruments with reverse action can just as easily be made as in the case of the pressure switch. As with all thermally responsive systems,

lack of heat transfer between the sensitive phial and the medium of surface changing temperature means that an hysteresis or lag occurs and this will, in effect, increase the apparent differential. Overcoming such lag is primarily an installation problem. Two other factors upset the performance of thermostats—barometric pressure and, in the case of liquid charged instruments operating under reversal conditions, installation head difference of power element and phial.

Barometric Pressure

Because vapour pressure instruments operate by pressure sensitivity, a change in ambient pressure will affect thermal setting, unless a compensation system is built into the instrument. This is due to the fact that the prime mover operates by reason of the pressure difference between interior and exterior, and should either one of these change, the movement of the prime mover will be affected. The amount of change is normally sufficiently small to be ignored, although it varies with the type of charge and in particular concerns refrigerants being used at low pressure. In general terms, an increase of altitude of 1,000 ft. will lower the temperature of operation at the same setting by between ½ and 2° F. depending on the refrigerant. A similar order of change occurs if the barometric pressure falls by 1 in. of mercury and conversely, the same increase in pressure lifts the thermal operating point the same amount. An instrument can be compensated for ambient pressure changes by opposing the power element with an identical one fully evacuated or having one side of the power element in an evacuated container, in this way barometric pressure changes are cancelled out.

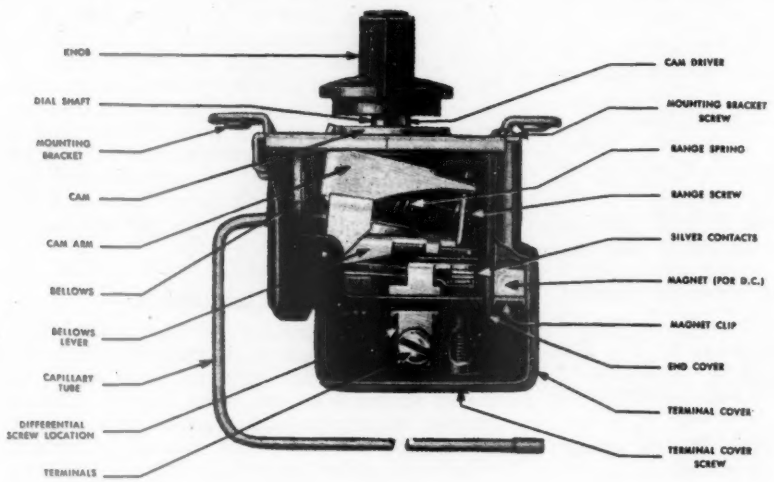
Head Effects

It can generally be assumed that head effects of phial above instrument and *vice versa* are small enough to be ignored up to 20 ft. or so as long as there is vapour in the capillary, that is, capillary and instrument head temperatures are above that of the phial. With the capillary filled with liquid, *i.e.*, in a reversed condition, the error is proportional to the weight of the liquid refrigerant at the temperature and pressure concerned. As an example, Refrigerant—12 would give an error of 0.6 lb. per sq. in. per ft. head, the effect of which in terms of temperature would depend on the temperature range in which the refrigerant in the instrument was being worked, but normally would cause a deviation from the original setting with no head effect, of ½ to 1½° F. per ft. head. This error would appear as apparent low thermal operation with the phial above head and *vice versa*. It will be appreciated that 10 or 20 ft. head could give an appreciable error, but it is emphasized that this applies only to instruments in the reversed condition, which is rare with large differences in head installation.

Application

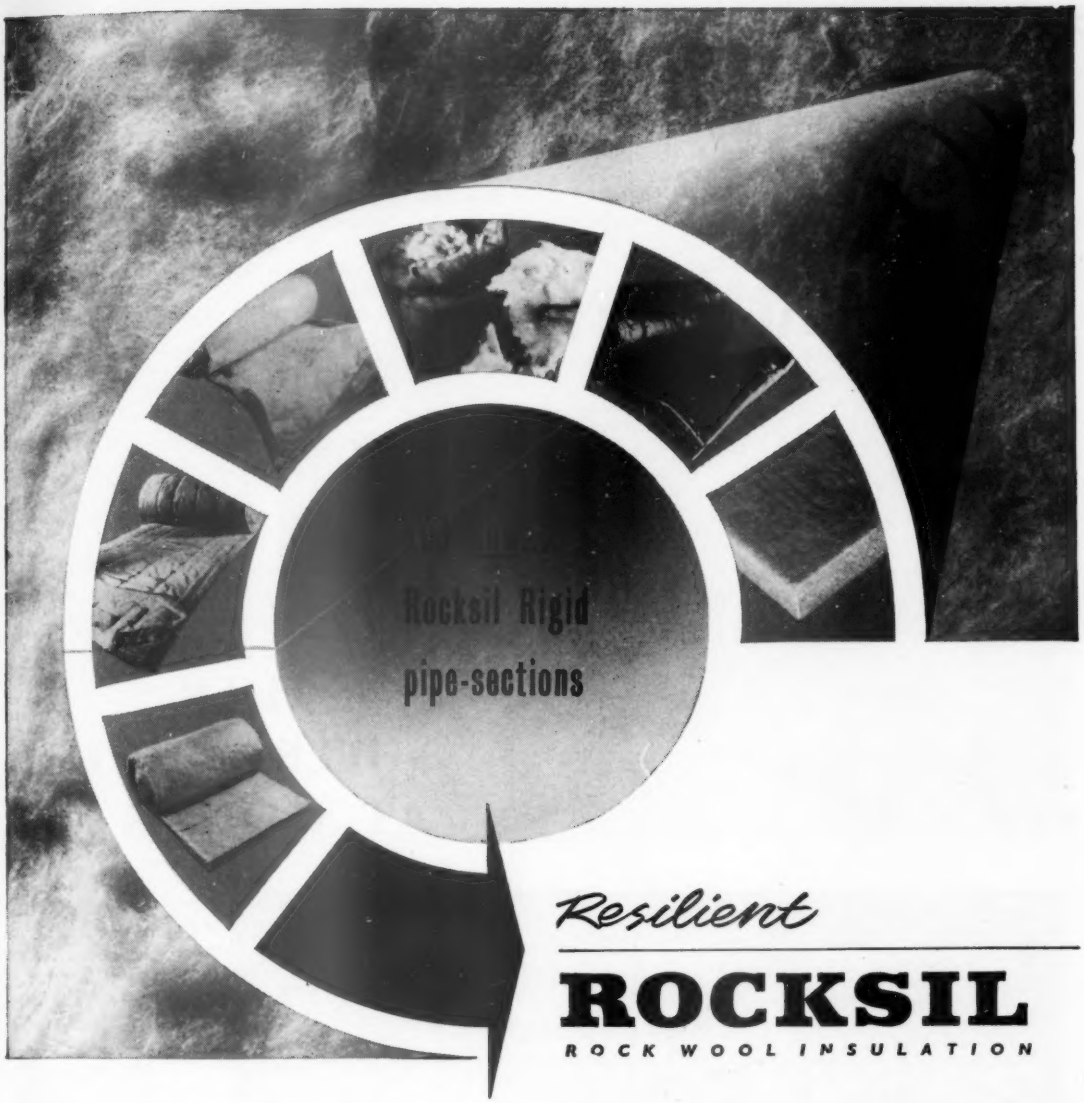
Irrespective of the type of control and its application, the most important point to realize is that a thermostat can only control on the basis of the temperature of its phial and good thermal contact is essential. This means that in the case of an air or liquid temperature-sensing phial, good circulation is required for the phial temperature to be representative, and in the case of surface fitting, such as an evaporator, only the temperature of that part of the surface to which the phial

(*Continued on page* 1031)



By courtesy Ranco Inc., U.S.A.

Fig. 36. — Typical domestic thermostat.



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ROCK WOOL INSULATION

That's the latest addition to this highly successful range of rock wool insulating materials. Great strength, accuracy of manufacture, and superior finish, along with all the usual properties of Rocksil, make these rigid sections an efficient means of insulation up to 600°F. For hot water lines, steam lines, and steam traced oil lines, Rocksil rigid pipe sections provide well-fitting and inexpensive insulation that is particularly resistant to corrosion.

Canvas or scrim wrapped, with or without bands.
In 3 ft. lengths, thicknesses by ½" steps from ½" to 2". Uniform density 10 lb/cu. ft.

CAPE

Full information available from the manufacturers :

THE CAPE ASBESTOS CO LTD 114 & 116 Park Street, London W.1. Telephone: GROsvenor 6022

and at: Glasgow: Eagle Buildings, 217 Bothwell St., Glasgow, C.2. Tel: Central 2175 Manchester: Floor D, National Buildings, St. Mary's Parsonage, Manchester 3. Tel: Deansgate 6016-7-8
Birmingham: 11 Waterloo St., Birmingham 2. Tel: Midland 6565-6-7 Newcastle: 19 & 20 Exchange Buildings, Newcastle-upon-Tyne. Tel: Newcastle 20488

SHOP REFRIGERATION NEWS

ANOTHER SUPERMARKET AT SLOUGH

Part of the 216 ft of Frigidaire refrigerated cases at Slough's new Waitrose Supermarket.

RECEIPTS will be rocketing in at least one cinema this year, but there will not be any film stars on the screen.

In fact there will not be a screen at all, for the Century Cinema, Slough (population

71,000) is now the town's 7th and Waitrose's 6th supermarket.

The new supermarket, which occupies a 9,018 sq. ft. space taking in the entire foyer and auditorium, together with a non-sales section of 10,300 sq. ft., is distinctive in three respects.

The front doors automatically lower into the ground; the check-out points cannot be seen from the entrance and the refrigerated display comprises one of the longest runs in the country. Refrigeration has been provided by Frigidaire Division of General Motors Ltd., and supplied and installed by R. E. A. Bott (Wigmore St.) Ltd.

The total refrigerated run is 216 ft. In addition to this equipment there is a large Frigidaire cold room divided into three compartments, a battery of four conservators for frozen food storage and a Frigidaire service cabinet for canteen use.

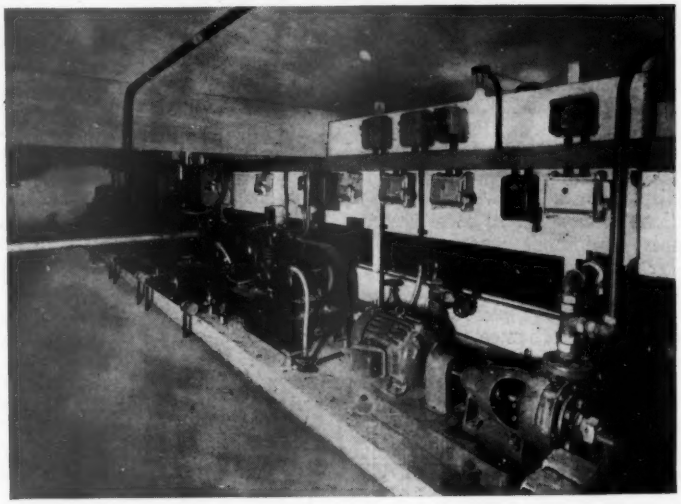
The display cases are standard Frigidaire Manhattan panelled in grotto blue. For the display of meat and poultry there is a 48 ft. continuous run with refrigerated storage compartments below. Dairy produce, provisions and cooked meats are displayed in two island sites made up of four 24 ft. Manhattan runs placed back to back.

A third island site of similar proportions is being used for the display of frozen food. This display of 48 ft. total is believed to be the longest run of frozen food cases in the country.

The cold room is divided into a 790 c.ft. chiller, 420 c.ft. freezer and 920 c.ft. provision and dairy room.

In addition to the refrigerated displays, delicatessen counter and a fruit and vegetable island, considerable space is devoted to non-food products, with emphasis being laid on toys, books and flowers.

Impulse buying is further encouraged by a display of poultry roasting on a revolving spit in the window. An unusual feature is the provision of two vending machines sited beyond the final check-out points. One provides cigarettes and snacks, and the other Frigidaire cooled ice-cream. The entire sales area is air-conditioned.



The "power house" containing 12 condensing units is sited underground at Waitrose's Supermarket, Slough.

EVERYTHING UNDER ONE ROOF

The co-operative societies all over the country have always been noted for the constant improvements they make for the benefit of their members. One of the latest examples of this is a new supermarket which has been opened by the Hartlepools Co-operative Society recently in Wynyard Road, Owton Manor Estate, West Hartlepool.

The name supermarket is no exaggeration here, for the building covers 2,400 sq. ft., and under its roof groceries and provisions, a complete butchery service, bread and confectionery, fruit and vegetables, cigarettes and tobacco all have their own departments. As one approaches the hall with its impressive exterior of brick and polished teak, the massive glass doors open onto the vast interior where over two hundred customers at a time can be accommodated, and the cashiers in the self-service section deal with about two every

minute. All the items in the store are attractively displayed and the price clearly marked; expert counter service is available in the butchery department as well as in the greengrocery and confectionery departments.

Perhaps the most impressive sections are those which offer the frozen and pre-packed foods: Here Prestcold refrigeration equipment, as throughout the rest of the store, provides a sparkling and attractive setting for the display of good foods, in addition to giving the very vital refrigerated protection required. The meat section for instance has, in addition to a built-in 250 cu. ft. coldroom, a Prestcold " Parade " self-service meat display case and a 6 ft. serve-over meat case for personal service. Frozen foods are displayed in a " Farmoor " display case and provisions and cooked meats in a " Parade " self-service grocer's display case. As with the meat section the provisions section has its own 250 cu. ft. coldroom. All this equipment was supplied and installed by Prestcold distributors, Refrigeration (Mitton) Ltd., of Newcastle upon Tyne.

The attractive surroundings of this store with its gay colour schemes, green-and-cream tiled floor, checkered acoustic board ceiling and the latest lighting effects provide a pleasing effect for the customer, and the refrigerated protection satisfies their hygienic-conscious minds, whilst the quality of the goods and the service is, as can be imagined, as good as anywhere in the country.

New Installations in Scotland

TWO recent conversions to self-service operation by Cooper and Company's Stores Ltd. in Scotland show the increasing importance of refrigerated display in such cases.

In both the Ayr store and the main store at Howard Street, Glasgow, this well-known Scottish food specialist group has installed much larger refrigerated space for customer service than was previously in use and the Ayr premises, in particular, have already experienced a considerable increase in volume of sales in those categories which have been affected by the introduction of this equipment.

The Ayr shop has been extended by taking in an adjoining shop; this has considerably lengthened the frontage and provided increased space for the larger units which have been incorporated. The 18 ft. long Frigidaire refrigerated, meat, self-service unit, for instance, takes up the major share of the left hand wall and now permits the company to handle fresh prepacked meat as well as the cooked meats which were handled in the original smaller unit. This innovation has already been proved a success and another interesting feature is the acceptance here of prepacked bacon. This again is made possible by the extended area of refrigerated space which is now available. This last point is particularly interesting in view of the caution which has been evident in Scotland to date on acceptance of prepacked bacon; at Cooper's the experience has been most satisfactory, the prepacked bacon being taken readily. Here, as in their other conversions, the store has carefully provided freedom of choice; the prepacked bacon is available for those who prefer that type of service but there is also counter service for those who still insist on traditional trading practice.

The frozen food section at Ayr is also a major improvement on the smaller original display. The new 12 ft. long Frigidaire unit is located at the rear of the converted store and has pride of place in its area. In the original section the cabinet was too limited to allow the presentation of the lines which were available and sales were undoubtedly affected by the limitation of display. Since the opening of the converted store the larger unit has added very substantially to frozen food sales and provides a very fine setting for a very complete range of packs.

In Glasgow the conversion has followed somewhat similar lines, both of these efforts being based on the earlier conversions which the firm has carried out in other branches. In effect, therefore, the current changes can be regarded as the result of a very considerable experience over a large variety of outlets and over a period of time. The firm is quite satisfied that display on the lines now applying can and does pay dividends. In that pattern refrigerated display has proved its worth and in the Glasgow store the larger units are again a feature. There are two additional island units here which deserve particular mention; these are devoted to prepacked meats and are located adjacent to the traditional-type meat shop which has been retained within the new set-up. This provides complete freedom of choice to the shopper who can have counter or self-service as desired. The two island units are devoted to prepacked Scotch meat and to New Zealand lamb, these names being carried boldly on the island unit. The prepacked meat can be bought at the meat shop counter on traditional lines but the lamb is sold solely on self-service lines and experience here has been most encouraging. Scottish approach to prepacked meat has been hesitant and relatively few firms feature it; here the experience has been such as to suggest that many more firms could usefully

A general view of one of Cooper's main food halls.

extend their prepacking into the meat field, with advantage to the customer and to their own sales.

Packs are on standard lines; fibre trays are transparent-wrapped and heat sealed, price and weight tabbed, and displayed for self-selection. All meat is handled on the premises and packs are made up as customer demand empties the display cabinets, both of which were specially built by Frigidaire for this purpose.

Here, as at Ayr, the 16 ft. long Frigidaire unit carries cooked meats, pies and other allied lines, the only difference being that the Ayr shop carries fresh meat packs along with the cooked meat while Glasgow has the two separate fresh meat units already mentioned. Again, as at Ayr, Glasgow has a new 16 ft. long Frigidaire frozen food open top display cabinet. Here again the experience has been most encouraging, with an expanded volume of frozen food sales an immediate result. Lighting is excellent and once again the cabinet has been given an excellent position, on its own, so that maximum attention is assured.

The main aspects of these conversions are thus considerably expanded refrigerated capacity and area for the show of prepacked foods; the provision of alternatives so that customers can select the system they prefer; and an expanded acceptance by these customers of prepacking; which suggests that much of the older caution has been eliminated. All the refrigerated equipment in these conversions was installed by Turner and Co. (Glasgow) Ltd., Frigidaire distributors for Scotland. The main Items are:

AYR—16-ft meat and cooked meat counter; multi-tier dairy case; 12-ft frozen food counter; window display case. Frigidaire condensing units used are: AD2.75/M ¾ h.p.; ADI.33M ⅓ h.p.; two MMH.4 sealed rotary condensing units; AD5.200/L with 3 h.p. motor.

GLASGOW—Two 6-ft island site meat cases; two 8-ft dairy cases; 8-ft three-tier dairy case; two 8-ft frozen food cases; 4-ft Cooltop case. Frigidaire condensing units used are: three AD3.100 1 h.p.; two AD5.200 2 h.p.; ADI.33⅓ h.p.

ANOTHER FULLY REFRIGERATED SUPERMARKET

THE conversion of erstwhile cinemas into food supermarkets seems to be the order of the day and a recent example is that at Bexleyheath in Kent, where Anthony Jackson's Foodfare Limited's latest premises cover an area of 11,900 sq.ft.

A feature characteristic of American supermarkets, but the first to be seen in this country, is the provision of a large car park; in this instance, there is accommodation for 200 vehicles.

This supermarket is the second to be opened by A.F.I. but others will be following at Chatham and elsewhere; twenty such buildings are planned for the next five years.

This supermarket offers to customers an enormous variety of goods at the lowest possible

prices. To give one instance of this variety, a selection of over 90 different kinds of cheese is available.

The housewife who visits this vast hall will not consider that this is just another visit to an ordinary shop; attractive styling, planned decor and even music while you shop all help to make the atmosphere light and social. Cups of coffee can be purchased by the thirsty customer whilst "carry-out boys" are on duty to carry goods from the store to the 200 capacity car park.

Naturally all the goods are displayed in a tasteful manner and a very impressive sight, not only from the visual but also from the hygienic view, is the 30 foot long, two tier, Prestcold display case for provisions. Of equal interest is the 28 foot length of Prestcold "Parade" display case for prepacked meat and poultry, which is fresh daily and direct from the farms, and even barbecue chickens are shown to the best advantage. Prepacked frozen fish in its own Prestcold frozen fish display case and three "Farmoor" frozen food cabinets all help to create an impression of hygiene at its best and induce customers to purchase the very tempting commodities. A 1,110 cubic foot built-in coldroom for storage purposes has also been provided, which, like the rest of the refrigeration equipment, was supplied by the London branch of Prestcold.

SWEDISH DISPLAY CASE

A newcomer to the refrigerated display cabinet field in this country is the Levin case from Malmo, Sweden.

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

THE PRESIDENTIAL ADDRESS

Sir Rupert De la Bère, BART., K.C.V.O., will deliver his presidential address at the meeting of the Institute to be held on Thursday, November 6th, 1958, at the Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London, E.C.3. The meeting will commence at 5.30 p.m.; tea will be served at 5 p.m.

SESSIONAL PROGRAMME 1958-59

The following programme has been arranged for the forthcoming session :—

November 6, 1958.—Sir Rupert De la Bère, BART., K.C.V.O., will deliver his presidential address.

December 4, 1958.—A review of the Moscow meetings of the International Institute of Refrigeration.

January 8, 1959.—" An economic evaluation of large ammonia absorption refrigerating machines " by G. G. Haselden, B.SC., PH.D., Associate Member.

January 28, 1959.—Annual Dinner at the Savoy Hotel, London, W.C.2.

February 5, 1959.—" Thermoelectric cooling " by H. J. Goldsmid, B.SC., PH.D.

March 5, 1959.—" Applications of refrigeration to horticultural produce in the Netherlands " by Ir. T. van Heile.

April 2, 1959.—" The measurement and determination of noise in small refrigerating machines " by W. R. Hall, B.SC.

May 7, 1959.—" Design problems in the storage and handling of liquid methane " by L. J. Clark, B.E.M., M.SC. (England). (Joint meeting with the Low Temperature Group of the Physical Society.)

All the above meetings will be held at The Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London, E.C.3. at 5.30 p.m. Tea will be served at 5 p.m.

HEAT TRANSFER IN THE NUCLEAR POWER PLANT

A special course of eight lectures on heat transfer in the nuclear power plant will be held at The Polytechnic, 309 Regent Street, London, W.1., commencing on October 14, 1958.

The lectures will be given by Mr. H. F. J. Hadrill, M.ENG., A.M.I.E.E. (Research and Development, C.E.G.B.) and Mr. R. Vaux, B.ENG. (Imperial College) on Tuesday evenings, from 6.30 to 8.30.

The course will cover the derivation and sources of theoretical and experimental heat transfer data, their application to the design of the heat transfer components of nuclear power plant, including the reactor coolant channels, and the consequential limitations on the thermodynamic cycle. Typical design calculations will be studied.

The fee for the course payable by students residing within the Administrative County of London is £1 1s. (including registration fee of 1s.). Details of fees payable by students living elsewhere may be obtained on application to the Director of Education of The Polytechnic.

Enrolment forms may be obtained on application to the Head of the Department of Civil and Mechanical Engineering at The Polytechnic.

THE REFRIGERATION RESEARCH FOUNDATION

Dr. H. C. " Dutch " Diehl has retired from the position of director of the Refrigeration Research Foundation, which has its headquarters in Colorado Springs, U.S.A. Dr. Diehl had been the director of the Foundation since it was founded in 1943.

Dr. Walter A. Maclinn, chairman of the Department of Food Science at Rutgers University, has been appointed to fill the vacancy caused by Dr. Diehl's retirement and he assumed his duties on September 1, 1958.

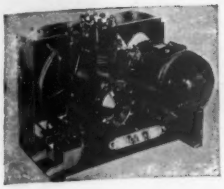
THE INSTITUTE LIBRARY

Lending Section (*Continued*)

Applications of Refrigeration :— Author	*Title*	*Publication date*
Brown	Air Conditioning & Elements of Refrigeration	1947
Burton	Super Conductivity	1933
Davis	Heat Pumps & Thermal Compressors	1950

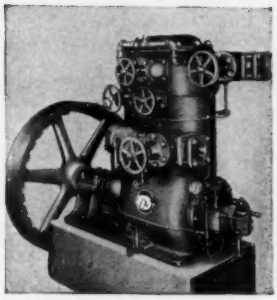
Applications of Refrigeration :— Author	*Title*	*Publication date*
Douglas	Refrigeration in the Dairy	1934
Feltham	Service for Soda-fountains	1936
Flosdorf	Freeze-drying	1949
Gray	Refrigeration in Ships	1932
Institute of Refrigeration	Refrigeration Monographs	1952
O.E.E.C.	The Cold Chain in the U.S.A.	1951
Schlienz	Die Kuhlfisch (in German)	1930
Shulters	Modern Marine Refrigeration	1943
Simon	Low Temperature Physics	1952
Somerset	Refrigeration for the Meat Trade	1948
Tressler & Evers	The Freezing Preservation of Foods	1947
Food Subjects		
Beveridge	British Food Control	1928
Cattington-Taylor	Food Wisdom	1926
Chenoweth	Food Preservation	1930
Critchell & Raymond	The History of the Frozen Meat Trade	1912
Enock	This Milk Business	1943
Fisk	The Book of Ice-Cream	1919
Hanson	Argentine Meat & the British Market	1937
Harrap & Douglas	Public Abattoirs & Cattle Markets	1901
McFall	The World's Meat	1927
Macnaghten	Pistol versus Poleaxe	1932
Maxwell	Handbook on the Meat Regulations, 1924	1924
Ministry of Agriculture & Fish'es	British Breeds of Livestock	1938
Pearse	The World's Meat Future	1918
Putnam	Supplying Britain's Meat	1923
Siebel & Schwartz	History of the Brewing Industry & Brewing Science in America	1933
Smith	The Marketing of Australian & New Zealand Primary Products	1936
Turnbow & Raffetto	Ice Cream	1928
Wood	The Meat Industry	—
General Engineering		
Alford	Bearings	1911
Baker	Incheley's Theory of Heat Engines	1938
Bragg	Marine Engine Design	1911
Brisloe	An Introduction to the Study of Fuel	1912
British Oxygen Company	Handbook for Oxy-acetylene Welders	—
Butler	Evolution of the Internal Combustion Engine	1912
Butler	Oil-Fuel	1914
Coste	Calorific Power of Gas	1911
Dejuhasz	The Engine Indicator	1934
Ewing	The Steam Engine & Other Heat Engines	1910
Granjon & Rosemberg	A Practical Manual of Autogenous Welding	1914
Harding & Willard	Mechanical Equipment of Buildings	1917
Institute of Marine Engineers	The Running & Maintenance of Marine Machinery	1933
Johnson & Huntley	Oil & Gas Production	1916
Kerr	Power & Power Transmission	1914
Kilburn	Copper & Bronze Welding	—
Kirschke	Gas & Oil Engines	1912
Lloyd's Register	Requirements for Welded Pressure Vessels Intended for Land Purposes	—
Mathot	The Construction and Working of Internal Combustion Engines	1910
McAdams	Heat Transmission	1933
Mitchell	Allen's Commercial Organic Analysis	1932
Overton	Heating & Ventilating	1944
Partington	Chemical Plumbing, Lead-burning & Oxy-acetylene Welding	—
Royds	The Testing of Motive Power Engines	1911
Southcombe	Lubricating Oil Tests	1934
Properties of Materials, Refrigerants, etc.		
British Standards Institution	Thermodynamic Properties of Refrigerants	1951
Din	Thermodynamic Functions of Gases	1956
"Elektron"	Magnesium Alloys	1937
Keyes & Browslee	Thermodynamic Properties of Ammonia	1916
Pohlmann	Tashenbuch fur Kaltetechniker (in German)	1935

(*To be continued*)



COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and distributors' news



We learn that **W. A. Taylor, Limited,** the long-established and well-known thermal insulation engineers of Mitcham, have reorganized their share capital with effect from September 1, 1958, by the capitalization of 95,000 of reserves. The new issued capital becomes £100,000. The direction of this go-ahead firm in the insulation field, which remains independent of any outside organizations, is still, of course, in the hands of Mr. R. Saunders, M.INST.R., M.R.S.H., who owns 99 per cent. of the shares.

* * *

The tastefully-produced annual report and accounts of **Bristol Industries Ltd.,** whose subsidiary companies include The Western Ice & Cold Storage Company Limited, The Bath Cold storage & Ice Company Limited, The Taunton Cold Storage & Ice Company Limited, Bristol Warehousing & Storage Company Limited, Western Transport Limited, Cox's Machinery Limited, Lectrix (Bristol) Limited, Alma Garages (Bristol) Limited, Rhodyate Service Station Limited, Contract Hire (Car & Commercial Vehicle) Limited, and Oldland Motor Body Builders Limited, show that after deductions, including depreciation £79,186 (£67,661) and taxation £36,723 (£15,142), the group's net profit for the year is £70,117, compared with £66,101 for the previous year. The chairman's statement, made on the 10th instant, reveals that the intensive development in the modernization and expansion of the group's cold storage, warehousing, road transport and other sections, that has taken place over the past few years, has involved the company in considerable capital expenditure. The cost has been met from the group's available cash resources and the expenditure has proved itself to be a vital factor in maintaining and improving revenue earnings. Any further development, involving additional capital expenditure, probably will be mainly centred on the group's cold storage undertakings and contract hire vehicle requirements. Vice-chairman of B.I.L. is, of course, Mr. F. H. Hunt, M.INST.R., well known in refrigeration and cold storage circles. The company has sustained a sad loss in the death of Mr. William Burke Jacobs last month. Mr. Jacobs was secretary of the company for many years and later an advisory director.

* * *

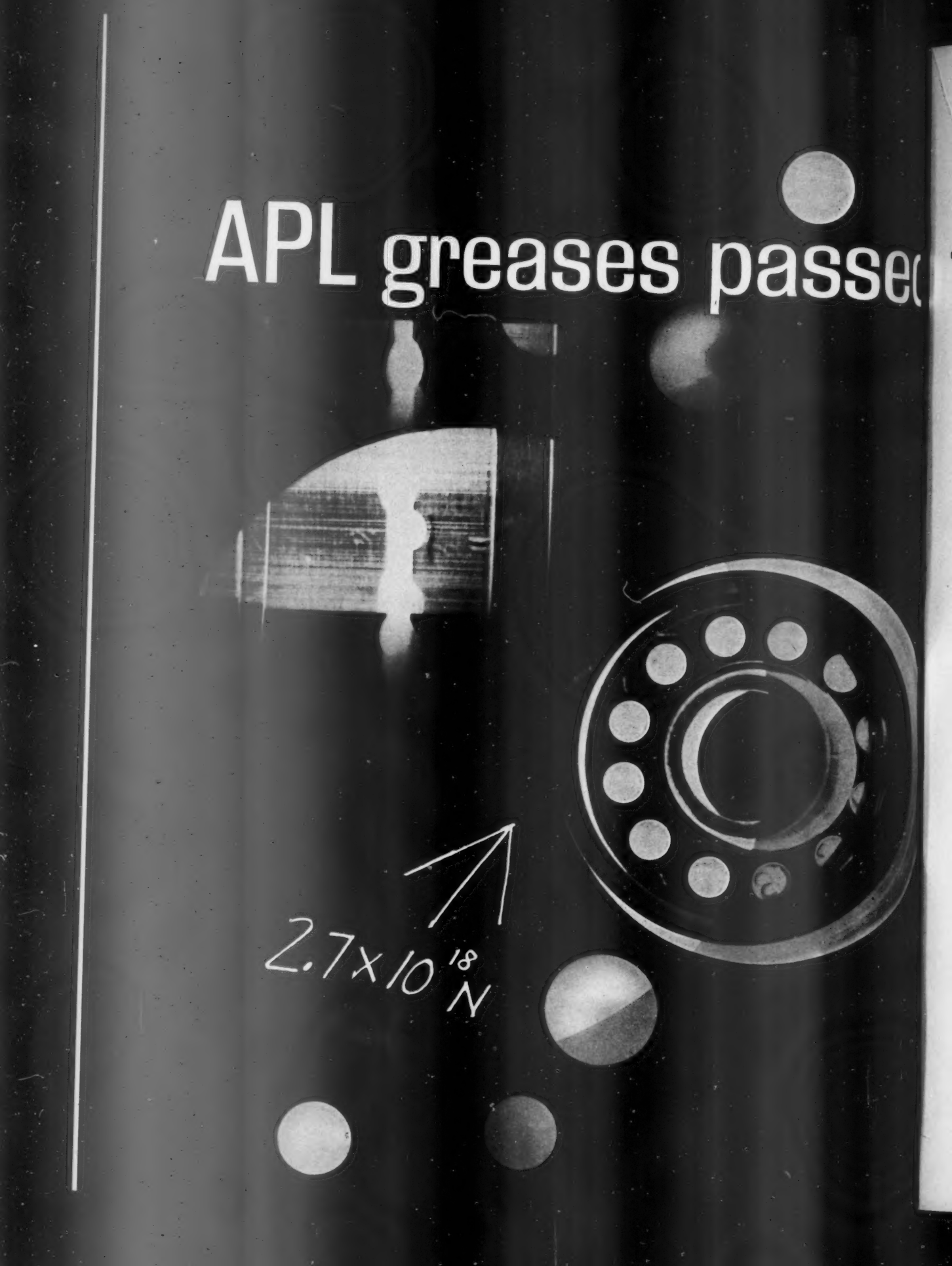
We learn that **Cook's Insulation Contractors Ltd.** of Hornsey, London, is now under entirely new management after nearly 25 years in this trade. The new directors are Mr. H. A. Kingston and Mrs. N. B. Kingston, and the manager, Mr. W. Singleton. The firm specializes in the erection and supply of cold rooms, cold stores, refrigerated counters, service counters, built-in work for the refrigeration industry at home and overseas. The offices and factory is at 15a Enfield Road, Hornsey, London, N.8. (Mountview 8214.). Recent installations include 700 c.ft. deep freezer for chickens, 2,000 c.ft. cold rooms for slaughterhouses, insulated stainless steel cabinets for ships' use, 40 c.ft. polished oak service-cabinets for sundry concerns, etc.

* * *

Recently a group of executives and Regional Managers from one of Britain's major frozen food producers, Smedley's Foods, spent a day visiting Prestcold factories at Cowley, Oxford, and Theale, near Reading, seeing in detail how Prestcold refrigerators are made. Naturally they were very interested in the equipment which stores and displays the foods they sell, and during the visit they had the opportunity of discussing with Prestcold sales executives, designers and engineers the many models which they saw being produced and on display (*photo last month*).

New frozen foods vehicle built by Oldland Motor Body Builders, subsidiary of Bristol Industries.

APL greases passe



their finals in June...

Radiation broke up the gel structure of conventional greases. They lost their lubricating properties, turned fluid or granulated. Completely new kinds of greases were needed by the atomic power industry for the bearings situated within the radiation field.

The Shell Group started working out radiation-resistant APL greases whilst most nuclear power stations were still on the drawing-board, and the research that went into them is characteristic of the way Shell set about doing things.

A team of research workers was assembled at Shell's Research Centre at Thornton. After four years of research and testing – both at Thornton and the A.E.R.E. Harwell – APL greases were ready for their finals. A sample was packed into a bearing and sunk into the B.E.P.O. pile. There it was not only subjected to mechanical working and high temperatures in CO_2, but also to an integrated pile dosage of 2.7×10^{18} thermal N. per sq. cm. plus associated radiation. APL greases sailed through their finals – and Shell are proud of it. They should be. For with these greases, Shell completed Britain's first range of Atomic Power Lubricants.

The moral of the APL story is that Shell research is supremely applicational. The Centre at Thornton is always ready to work with even the most specialised sectors of industry to produce the right lubricant for the job. If you and your organisation have any major lubrication problem, it will pay you to get in touch with your local distributor of Shell Industrial Lubricants.

The Research Story

Naturally a whole variety of greases were investigated. Conventional metallic soap greases were affected even by relatively low levels of radiation. Other greases based on synthetic and non-petroleum materials were examined and found to be equally unstable. Some of them softened appreciably and became tacky, whilst others hardened.

The Shell APL 700 series of greases are specially processed with an inorganic gelling agent, the base lubricant used being similar to the APL oils previously proved highly resistant to radiation. There were three series of tests. First tests were preliminary radiation tests at Harwell. Then the greases were tested for their lubricating qualities in a high temperature (400°F) pressurised CO_2 anti-friction bearing rig turning at 1,500 r.p.m. For the final tests in June, actual working conditions were simulated at Harwell.

SHELL

ATOMIC POWER LUBRICANTS

another proof of Shell leadership in lubrication

Negretti & Zambra Ltd. are acquiring the whole of the share capital of New Western (Engineering) Ltd., the instrument installation engineers and contractors of Leeds. New Western (Engineering) Ltd. have recently completed the extensions to Calder Hall Nuclear Power Station and have the contracts for the instrumentation for the four reactors at Chapel Cross. The activities of New Western (Engineering) Ltd. will continue as before, including the manufacture of instrument panels and cubicles. They will also expand their facilities for both light and heavy fabrications to meet the growing demands for quality products. In addition the firm, which will be known as New Western (Negretti) Ltd., will include the design engineering of instrument projects. They will also expand their facilities for both works and site instrument erection. The activities at present centred in Leeds will be duplicated in Aylesbury where a modern factory has been obtained. The management will remain unchanged under the managing directorship of Mr. S. G. Lockley.

* * *

The Crystal Tips automatic ice maker is a newcomer in the hotel and catering field. It is being introduced to the trade by **Auto-Ice Ltd.**, of 83, Piccadilly, W.1. The Crystal Tips machine forms pure crystal clear ice in tips and chips as required (at the touch of a switch). A built-in thermostatic control governs production and maintains supplies of up to 170 lb. total in the storage bin. It is entirely British made, under licence from the U.S. Ice-Making Machine Corporation.

Specification

Capacity : Produces in excess of 5,000 tips—or 10,000 chips—a day. Bin stores up to 170 lb. ice—the maximum for one full production cycle.

Compressor : Powered by one-third h.p. Kelvinator hermetic, 230/250 - volt, single - phase, 50 - cycle. Other voltages supplied. Compressor warranted for five years by Kelvinator and the ice maker by Auto-Ice Ltd. for one year.

Dimensions : Height 38¾ in. ; width 32¾ in. ; depth 26 in. ; weight 320 lb. approx. Occupies less than 6 sq. ft. floor space.

Plumbing : Water inlet ¼ in. B.S.P. ; drain ¾ in. B.S.P.

Price : £285 delivered free in home counties.

* * *

A new range of self-contained air conditioning units—claimed to be the most compact ever produced for marine use—is being introduced by **Thermotank Ltd.**, Helen Street, Glasgow. The range, known as series P, comprises two water-cooled units and two air-cooled units, all of which have been proved under tropical working conditions. They have been designed for low-cost, full air-conditioning of selected spaces, and the capacity of a single unit is claimed to be adequate to deal with the average ship's cabin. The approximate overall dimensions of the water-cooled versions are 28 in. long, 14 in. high and 11½ in. deep—the air-cooled units having the same facia size but being 7 in. deeper. The casing is acoustically, as well as thermally, insulated to ensure quiet operation, and is fitted with attachment bars to facilitate surface mounting on a wall or bulkhead. Each unit incorporates an hermetically-sealed motor/compressor operating on " Freon-22 " refrigerant ; cooling coil ; washable nylon mesh air filter ; thermostat ; and a rotatable 10 in. diameter air discharge grille for draughtless diffusion of the air after it has been filtered, cooled and dehumidified. The units are designed to operate on an a.c. power supply. The water-cooled units are designed to operate with seawater temperatures up to 90° F, and the

Lady Lewisham escorted by Mr. George Reynolds (centre), of Parnall (Yate) Ltd., inspects the new Parnall Alaska 101 refrigerator at the Domestic Equipment Trades Fair.

air-cooled versions with a maximum ambient temperature of 120° F. The former have loadings of 4,480 and 7,200 B.t.u. per hour, and the latter 4,400 and 6,700 B.t.u. per hour.

* * *

Monsanto Chemicals Ltd., have appointed Mr. D. C. M. Salt to the newly created post of general manager in charge of chemicals division, and of Mr. G. Dodd to the corresponding post of general manager in charge of plastics and special products division ; both appointments took effect on September 1. Both general managers will be responsible to the managing director, Mr. D. R. Mackie. Mr. D. R. Mackie and Dr. J. W. Barrett, the company's technical director, who, as directors of the chemicals and plastics divisions respectively, have been responsible since June 1957 for the successful initial establishment of divisional operations, are freed to concentrate upon their major company functions as a direct consequence of the new appointments. The appointment of Mr. Dodd to his new post leaves his present position as controller of purchases vacant. Mr. J. V. Head is consequently appointed acting controller of purchases.

Expandite Ltd. have issued new information on Barra Frost, a concrete additive which, by decreasing the setting time, reduces the period during which frost can cause damage. At the same time, the rate of evolution of the heat of hydration is increased.

* * *

Air Control Installations Limited's new leaflets describe their "Omicron" air filter, which offers the highest efficiency of any filter available at the present time, it is claimed, and the AAF filter gauge, a compact instrument which gives automatic warning when filters should be changed ; this very useful instrument measures only about 1½ in. by 1½ in. by 3 in. high.

* * *

Crane Packing Ltd. of Slough, one of the first companies in this country to process and fabricate PTFE (polytetrafluoroethylene), have recently published a 26-page booklet describing this remarkable plastic. Contents include : processing of the basic raw material — moulding and extrusion — raw material forms — properties — material grades and their applications — PTFE components — dispersion coatings — bellows pump — bellows — the Fluoseal — "O" rings, etc. Descriptions are illustrated with photographs, diagrams, tables and charts to make this booklet an up-to-date and complete source of reference to PTFE.

* * *

Flexibox Ltd., manufacturers of mechanical seals for rotary shaft equipment, have appointed John Turner & Co., 25 Collingwood Street, Newcastle upon Tyne, 1, as agents for the north-eastern area of Great Britain. The appointment became effective on September 1. Mr. G. L. Towers, B.SC., joined Flexibox at the same date as sales engineer. Based on Birmingham, he will be responsible for sales and service in the midlands area.

* * *

L. D. Wood (Eldwood) Ltd., for 30 years manufacturers of refrigeration cabinets, are now extending production to include packaged equipment. In addition to making cabinets for other manufacturers complete with units, new models are now being produced at Wembley. The first is a small island site display, mounted on castors and suitable for numerous trades such as groceries, bakeries, the confectionery trade and for wine and bottle cooling.

THE NEW "TROPICAL" AIR-COOLED AIR-CONDITIONER

TEMPERATURE LIMITED of London have introduced their latest air cooling and dehumidifying unit in the "Tropical" *air cooled* 1½ h.p. hermetic type room conditioner. Suitable for 220/250 or 190/210 volts, single phase alternating current supply, the unit has been designed for use in areas with high relative humidities. The evaporator coil has been designed for maximum moisture removal and is fitted with a finned sub-cooling coil between the indoor coil and leaving air grille, thereby reducing the relative humidity of the leaving air and preventing condensate forming on the facia during very humid weather. The unit is designed to cool the average sized modern room or office.

A centrifugal type indoor coil fan with noise reducing plastic scroll delivers approximately 300 c.f.m. of conditioned air being directly driven by the 4 pole permanent capacitor type tropicalized fan motor having double shaft which also drives the six bladed kidney shaped condenser fan.

To prevent rusting, the outer casing has been constructed from fully weatherproofed, heavy gauge, aluminium sheet, having vermin proofed thermal and acoustic insulation, and is designed to permit flush installation, inside, outside or in any intermediate position. In either case, the protrusion inside or outside is small, as the machine is of the "thin line" type having dimensions of 18 in. deep, 29 in. wide and 16 in. high.

Condensate disposal is by slinger ring attached to the periphery of condenser fan.

The evaporator is protected against icing under light load by an efficient thermostat of the defrost type.

Modern styling, aptly describes the attractive facia, which incorporates a rotatable air discharge grille for directional air control and draught prevention. Each unit receives a six hour test run at site conditions prior to despatch, being the established custom of Temperature Limited, the largest producer of "packaged" air conditioners outside the U.S.A.

At this moment, on a drawing board somewhere, is a design which could mean an entirely new product. It could be a product for either light or heavy industry: for instance, toys or electronics, household appliances or chemicals. But whatever the field, when the time comes for bulk manufacture, there are powerful reasons—mechanical, chemical, dielectric and economic—for believing that the material chosen will be high impact polystyrene.

When that happens it will not be just happy chance if the selected brand of polystyrene is Iridon. Iridon Limited have the resources and the experience to meet the demands of every new development the moment it becomes a mass market proposition. Iridon Limited are constantly perfecting new techniques, new processes; constantly exploring the immense possibilities in plastics—always with the aim of fitting them for the ever-changing pattern of industry.

If your particular pattern needs the best in thermoplastic sheeting to add to its competetive potential, you could profitably contact Iridon.

Iridon

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Member of the CP Group—one of the world's major manufacturers of plastics sheet and film.

A most instructive day was spent by visitors from the trade and others, nearly 250 people, who took the opportunity of seeing the works of **T. H. & J. Daniels, Ltd.,** Stroud, in action. Many of these guests were drawn from the plastics and rubber industries, and for them the major interest was in the presses and injection moulding machines which were operating. The machine which aroused most interest, probably because it is the first of its type to be built in this country, was the Daniels/Latymer 30/30 R.D.P. vacuum forming machine. The plastics moulding equipment manufactured by this company is sold in this country by Alfred Herbert Ltd., with whom Daniels have been associated for some 20 years, and the injection moulding machines which were on display were made exclusively for Alfred Herbert Ltd. That the company's activities are not confined to plastics moulding equipment was shown by the display of equipment by the other companies associated with T. H. & J. Daniels Ltd.—B.B.A Ltd., who manufacture heat exchangers and other steam equipment which is of interest to those who use steam heating in the plastics, rubber and chemical industries and also to the refrigeration industry. Of general interest were the products of Prat-Daniel (Stanmore) Ltd., whose range of dust-collecting equipment was on show. Other members of the Daniels Group of Companies participated in the display.

Injection moulding machine at the Stroud works of T. H. & J. Daniels Ltd.

A main view of one of the heavy engineering shops.

* * *

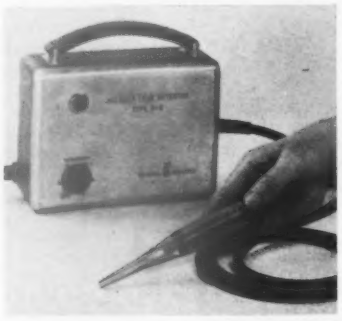
Teddington Refrigeration Controls Ltd. have recently added to their range of RP thermostatic expansion valves models for use on F.22 refrigerant. These are available with similar seat sizes to existing valves, viz : 0·04 in., 0·06 in. and 0·10 in., having nominal capacities of 8,000, 12,000 and 18,000 B.t.u./h respectively.

* * *

At the forty-third annual general meeting of United Dairies Ltd. held at The Connaught Rooms, Great Queen Street, London, W.C., Mr. Leonard Maggs, chairman and manager director, presiding, referred to the **U.D. Engineering Co. Ltd.** in the following terms : " Despite continuing credit restrictions at home and economic difficulties overseas, and the changing pattern of demand, evidence of the need for the productions of our engineering company is provided by the improvement in the flow of orders for bottling, mechanical handling, and industrial refrigerating equipment. Undoubtedly some part of the improvement can be ascribed to the last Dairy Show, at which the full range of the machinery which the company can offer was successfully exhibited and demonstrated. Our efforts to introduce this equipment to other industries and applications have met with some success, for orders have been received from several breweries at home and abroad. During the year another substantial contract for the U.S.S.R. was successfully completed, as were a number of installations of refrigerating plant, some of a highly specialized nature, for chemical and other industries. The application of

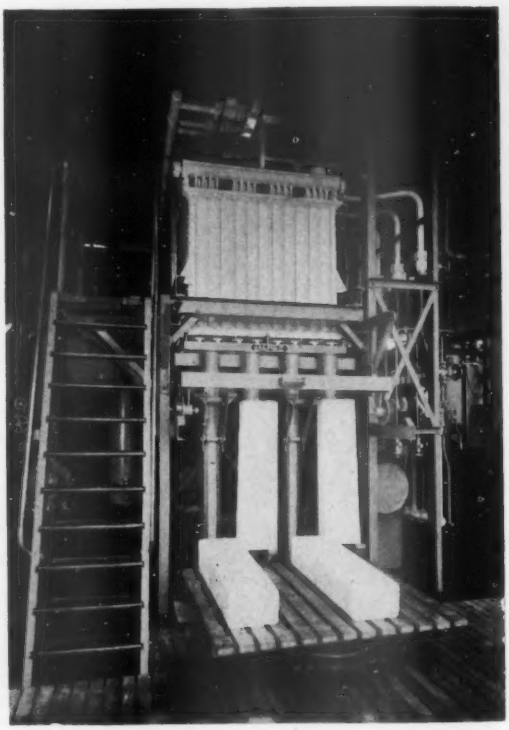
refrigeration to modern industry and processes seems always to be increasing, and the prospects of this division of our engineering company appear to be very satisfactory, in both the short and the long term. Orders are in hand at a satisfactory level, and although the market for capital goods is a keen one, and subject to forces which are not always within our control, nevertheless, I believe that provided we are aware of trends and developments, and remain flexible to meet the demands likely to be placed on our engineering company, we can face the future with confidence." * * *

General Electric Company of New York has announced a new low cost, highly sensitive leak detector developed specifically for the air-conditioning and refrigeration service man. Engineers at the company's instrument department, West Lynn, Mass., point out that the new type H-6 is more sensitive and gives faster response than the common halide torch. Also, its sensitivity is unaffected by brilliant light or air



circulation and there is no flame to cause fires, burn users or blow out. " Air-conditioning and refrigeration service men will be able to work more quickly with the H-6," the engineers added, " making possible more calls in the working day." Capable of pinpointing leaks within a distance of ¼ in., the unit consists of a probe and a control unit. It automatically adjusts itself for an atmosphere containing a refrigerant such as " Freon," " Genetron " or Isotron. The instrument responds only when a change in concentration is detected as the probe passes a leak. An indicating light, housed within the transport plastic probe, lights up for about one second when a leak is detected. Large leaks cause a double flash. The unit will recover in a little more than one second when removed from the leak. The sensing element in the control unit has a life expectancy of approximately 100 hours when used intermittently. This corresponds to several weeks use for field servicing. Replacement parts for the sensing element are readily available and can be inserted in about five minutes. The complete type H-6—probe and control box—has a shipping weight of only 10 lb. The probe is 7 in. long, 1 in. in diameter and is connected to the control unit with 6 ft. of flexible tubing. The control box is 8 in. long, 6 in. high and 3½ in. deep. A 12-ft. power cord is used for connection to a 115-volt a.c. outlet. * * *

A new type of free-wheel clutch, capable of handling one-half horsepower at 1,500 r.p.m. depending upon load conditions, has been designed and manufactured by the research and development engineers, **Tiltman Langley Ltd.**, of Redhill Aerodrome, Surrey. The free-wheel is said to be able to operate at extremely low temperatures—minus 40° C.—and is also suitable for use in tropical conditions. The essential components of the free-wheel are Housing—pinned to shaft ; Cam—with gear attached ; Cage—to hold rollers in correct position ; Spring—to hold cage in position ; Stop Pin ; Roller. The housing is normally the driving member and is fixed to the shaft by a mills pin. The cage holds the rollers into the wedge formed by the housing and cam, when the housing rotates in the same direction as the cage spring force, engagement takes place and the drive is transmitted through the cam to the gear. If the gear rotates faster than the housing, free-wheel action takes place ; similarly, if the drive is stopped, the gear is free to rotate independently of the housing. Alternatively, the gear can be the driving member, the free-wheel action being as described above, except that the rotation is reversed unless spring is changed.



The patented Wilbushewich system of rapid ice block manufacture being demonstrated by J. & E. Hall Ltd., licensees in the U.K. and Commonwealth of this method. *(More details will be given next month.)*

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WITH A DIFFERENTIAL OF 3°F

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The large variety of models together cover the range —30°F to +105°F (—34°C to +40°C) each having a range of 30°F to 40°F.

FOR A WIDE RANGE OF COMMERCIAL REFRIGERATION EQUIPMENT

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SNAP ACTION SWITCH
RATED 1 H.P. (or 10 amps) A.C. NON-INDUCTIVE
½ H.P. (or 500 watts) D.C. NON-INDUCTIVE
on 110/250 volts.

SUPPLIED WITH UP TO 15 FT CAPILLARY

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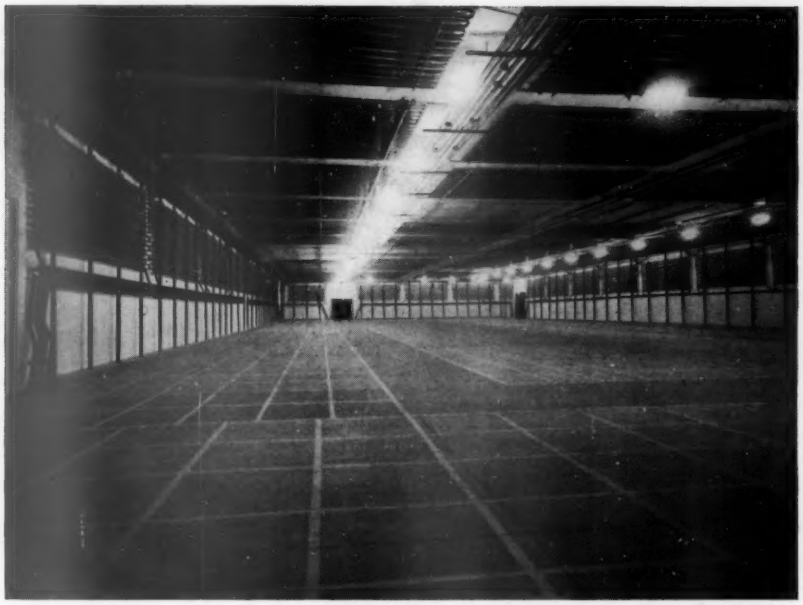


One of the largest Insulation and cold store construction companies in the country, Smiths Insulations Ltd., Burton-on-Trent, have just completed the construction of the largest single-span cold store in Europe, shown here.

NEW PALLETIZED STORE FOR BIRDS EYE

MATCHING their developments in the field of refrigerated transport, described in these columns last month, has been Birds Eye Foods' progress in cold store design. Their latest example of this was opened at Lowestoft in September.

A site for setting up factory cold storage was acquired and all approvals for the commencement of construction obtained in January, 1958. At this time plans had already been made in detail and work was able to start immediately.

The store has been planned to allow full scale palletization to operate from two main parallel gangways with a target stock holding of approximately 4,200 tons. Arrangements include the possibility of expanding the store in two lots each of approximately 5,000 tons without interruption of operation. The overall lay-out of the store with the two possible extensions takes the shape of a letter U with the current construction the base of the U and the engine room in the crutch of the U. The engine room is large enough to cater for the first store only but is capable of expansion along with storage.

Since the site acquired was two feet under water during the 1953 floods it was decided to build the store and engine room at a floor height of four feet above ground, i.e. at vehicle loading height, and further to tank them with a three feet high water proofed 9 in. brick wall with metal flood gates at access point.

Foundations take the form of 9 in. brick sleeper walls at about 9 ft. centres set in concrete and topped by precast reinforced concrete beams on which the cold store is built. No heating mattress is required due to the open nature of the foundations.

The loading dock running down the length of the store is surfaced by Ferrogran flags set in cement. Office and toilet accommodation together with a garage and battery charging room for the mechanical handling equipment is situated on the loading dock between two airlocks, the latter being the main means of exit from the cold store.

Inloading to the store from the factory is up a ramp built at the gable end of the store leading

to a third airlock. A canopy extends over the loading dock and inloading ramp.

Stacking trucks have been acquired that require an 8 ft. gangway only as opposed to the previous 11 ft. gangway.

The overall dimensions of the store are :—

Internal : 252 ft. long by 112 ft. 3 in. by 20 ft. high.

External : 253 ft. 9 in. by 116 ft. 8 in. not including airlocks and loading bank.

The general construction of the store itself consists of 6 in. thick prefabricated sections of insulation on walls and ceiling with further 2 in. by 2 in. cork slabs applied on site, the whole being fully vapour proofed. The floor is of 10 in. of cork applied on site. The first 6 in. of insulation on the ceiling is expanded polystyrene but cork is used throughout on the walls. The final 2 in. of insulation is grooved for Minikay dehydration.

The outer cladding of the store is in aluminium behind which are two layers of asbestos board and and air gap to conform to fire regulations. The roof is of Big Six asbestos sheeting.

The store is contained within a steel framed structure with 5° trusses capable of taking the load of ceiling and refrigeration coils without internal support.

The floor of the store is of 3 in. granolithic cement, coloured in the gangways and painted with the entire pallet lay-out.

Airlocks are vapour proofed but non-insulated and include personnel doors. The main doors are supplemented by double leaf rubber swing doors.

Foundations of the engine room are of solid fill and are of sufficient size to accommodate outside the engine room, at 4 ft. above ground but still behind flood protection, an electricity supply substation.

The condensers are situated on the roof above the compressors but are hidden from the public highway by the store itself. Water storage in the amount of 2,000 galls. is also contained on the roof.

The compressor equipment consists of three sets each of two ammonia compressors driven by a double-shafted 112½ h.p. motor. On rising temperature one set will cut in. The second set, acting as a booster, will cut in on a further rising temperature. The third set is a spare. Manual switching is arranged to spread the running time evenly.

Control of the equipment is automatic through a controller in the engine room which also indicates and records the average temperature in the store. Should the temperature rise above −2° F. an alarm bell and warning light is set into operation.

The Minikay dehydration of insulation equipment is incorporated in the system, the dehydrator being housed in the engine room.

Approximate capital cost of the overall project is expected to be £260,000 and the construction programme has been as follows.

Construction Programme

Architect's Work

Cold store foundations commenced	January 22
" " " progressed sufficiently to allow steel work to commence ...	March 2
Engine room foundations complete ...	April 3
" " roof ready for condensers " " floor and foundations ready for compressors	Mid-May

Insulation and Construction

Steel work commenced	March 2
Ready for refrigeration engineers to commence grid coil installation	End-April
Completely finished inside store	End-May
Engine room steel work commenced	April 3
" " " " and surge drum area roof to allow refrigeration engineers to commence work	April 9

Refrigeration Engineers' Work

Commenced coil installation	End-April
" work in surge drum room ...	End-April
" installation of compressor equipment	June 10
Refrigeration installation completed and tested	July 20
Insulation of headers complete	July 24
Cool down period—Product in	August 5

Electrical Work

First two electric motors despatched to refrigeration engineers	June 2
Third motor despatched	June 25
Electrical work completed within the above period with the exception of the control equipment.	
Control equipment installed and operating ...	September 3

The organizations responsible for the building and equipment of the store have been :—

General design, co-ordination and progressing of work :—Birds Eye Foods Cold Storage Dept.
Architect :—A. T. Wright, Norwich.
Groundworks :—Bush Builders (Norwich) Ltd.
Fencing :—Boulton & Paul, Norwich.
Insulation and cold store construction ; engine room fabric :—Smiths Insulations Ltd.
Refrigeration :—Unilever Ltd. technical division, mechanical section, and The Lightfoot Refrigeration Co. Ltd.
Dehydration System :—Minikay Ltd.
Electrical :—Unilever Ltd., technical division, electrica section and J. H. Plant Ltd.

Mechanical Handling

Fork lift trucks :—Jewsbury's Mechanical Handling Ltd., Manchester.
Pallet trucks :—Yale & Town Mfg. Co., Wednesfield.
Pallet trailers :—Lansing Bagnall, Basingstoke.
Pallet trailers prime mover :—R. A. Lister, Dursley.
Batteries :—Exide, Birmingham.
Battery chargers :—Legg Industries Ltd., Wolverhampton.
Pallets :—Jewsons, Yarmouth.

Air-conditioning Show for the United States

SOME three months before the 14th International Heating and Air-Conditioning Exposition takes place in Philadelphia (January 26-29), space has already been booked for some 450 exhibits. The event is being held under the auspices of the American Society of Heating and Air-Conditioning Engineers and will run in conjunction with that body's annual meeting.

The show will combine displays of the many kinds of equipment required to compensate for the influence of the weather on industrial operations as well as on human comfort.

Visitors will be drawn to the event from almost every American manufacturing industry, from all branches of the construction field, public works and public utilities. The outlets and distributive channels for heating, ventilating and air-conditioning equipment will account for thousands of visitors. The general public will not be admitted.

A factor in the American economy to which professional economists are apt to give too little credit is the sub-stratum of suppliers underlying every industry of magnitude. The air-conditioning industry leans heavily on this supporting structure—which will be represented by a number of stands at the exposition.

The industry, incidentally, has lately been handed down the first Air-Conditioning and Refrigeration Institute Standard for heat-operated air-conditioning units. This is entitled ARI Standard 250-58, "Unitary heat-operated air-conditioning equipment," it applies to units "whose major energy input is in the form of heat —either directly from gas or oil combustion, or from such energy sources as hot water, steam, or electric resistance units."

The gas utility industry has recently redoubled its efforts to develop and market gas-operated air-conditioning equipment and a number of manufacturers are producing such equipment, which is also usable with other heat sources.

The new standard applies to factory-made "residential, commercial, and industrial heat-operated air-conditioners or matched assemblies. . . . which normally include an evaporator or air-cooling coil, a heat-operated cooling apparatus, and may include a heating function as well. . . ." It provides a companion to ARI Standard 210-58, "Unitary air-conditioners," and provides that "Standard ratings relating to cooling capacity shall be stated as the total cooling capacity and expressed only in terms of B.t.u. per hour in multiples of 1,000 B.t.u. per hour. . . ."

The standard was developed by ARI's engineering department under the direction of the engineering committee of the ARI unitary air-conditioner section.

New Companies

The accompanying particulars of New Companies recently registered are taken from the Daily Register compiled by Messrs. Jordan and Sons Ltd.

Covent Ltd., 37, Brighton Road, Sutton, Surrey. Secretary : Marjorie Cove. To carry on business of heating, ventilating, air-conditioning, electrical and industrial welfare consultants, engineers and contractors, etc. Capital : £1,000. Directors : John W. S. Cove (permanent) and Mrs. Marjorie Cove, 23, Manor Road North, Wallington, Surrey. Registered by F. S. Moore Ltd.

Industrial Insulation (Derby) Ltd., Tamworth Street Works, Duffield, nr. Derby. Secretary : Douglas G. Stone. Capital : £1,000. Directors : Alan N. Ford, The Manor House, Chellaston, Derby ; Douglas G. Stone, Tamworth Street, Duffield, nr. Derby. Registered by Shaw and Sons Ltd.

Technicool Ltd., 37, Manchester Street, W.1. To carry on business of refrigeration and cold storage engineers, etc. Capital : £100. Director : Ralph Schryber, 23, London Road, Stanmore, Middx. Registered by Shaw and Blake Ltd.

Hotpoint Electric Appliance Co. Ltd. Capital : £100. Directors not named. Subscribers : B. W. Burnett, 92, Marlpit Lane, Coulsdon, Surrey (co-secretary) ; E. Sheehy, 26, Hartington Road, Southall, Middx. (secretarial assistant). Registered by solicitor : Michael J. A. Broom, Crown House, Aldwych, W.C.2.

Frigo European Road Services Ltd. Capital : £100. Directors to be appointed by subscribers. Subscribers : Ralph Sinclair, 147a, Kensington High Street, W.8 ; John C. Huppert, 2, Rosemont Court, Rosemont Road, W.3 (clerk). Solicitors : Polden and Co., W.1. Registered by Inclusive Service Ltd.

Gardner Refrigeration Service Ltd. Capital : £100. Directors to be appointed by subscribers. Subscribers : John J. Gardner and Mrs. Marjorie Gardner, 10, St. Martin's Road, S.W.9. Secretary : E. E. Mortimer. Registered by Birkett Boughey and Co., 17, Farringdon Street, E.C.4.

Coolduct Refrigeration Ltd., 431, Great West Road, Hounslow, Middx. Secretary : Cynthia Tisman. Capital : £100. Directors : Derek R. Tisman, 26, Corfe Avenue, Harrow, Middx. ; Alexr. C. Watts, 2, Cottage Farm Way, Thorpe Egham, Surrey. Solicitors : Owen White and Catlin, Hounslow. Registered by Solicitors' Law Stationery Society Ltd.

Van den Bosch Ltd., 19/21, Moorgate, E.C.2. To carry on business of importers and manufacturers of and dealers in air-conditioning equipment, etc. Capital : £100. Directors to be appointed by subscribers. Subscribers : Charles Polaine, 27, Southsea Avenue, Leigh-on-Sea (clerk) ; Audrey Kemp, 77, St. Audrey Avenue, Bexleyheath, Kent (clerk). Registered by solicitors : Nicholson Graham and Jones, E.C.2.

Surrey Sales (Morden) Ltd., 118, Central Road, Morden, Surrey. Secretary : M. Blank. To trade in ice cream and confectionery, etc. Capital : £100. Permanent directors : Michael E. Oxborrow, 3, Hawkswood Rise, Great Bookham, Surrey ; Trevor D. Axtell, 63, Ashley Avenue, Chessington, Surrey. Registered by the Secretary.

REFRIGERATION FOR THE CATERER

The opening of London's first new theatre-restaurant " The Talk of the Town " last month not only heralded a unique approach to the recurrent problems of the theatrical world, but provided an unusual example of the application of refrigeration in a large scale catering project. Frigidaire Division of General Motors Ltd. have provided refrigeration throughout the kitchen, food preparation rooms and wine dispense bars in " The Talk of the Town," and R. E. A. Bott (Wigmore St.) Ltd., have supplied and installed this equipment.

Refrigeration has been located at seven different points. In the basement preparation room, a 370 c.ft. cold room, operating at 32-34° F. has been provided for meat storage. This cold room is equipped with a Frigidaire WD2-50/M water-cooled condensing unit and evaporator model DX-603, and with a 20 c.ft. fish cabinet fitted in the lower section with fish trays and equipped with a Frigidaire MMH-2 rotary sealed condensing unit.

The pastry room contains a special low temperature cabinet with a capacity of 45 c.ft. all-metal finish and equipped with a liner coil designed to operate at −5 to 0° F. The cabinet is equipped with an AD2-50/L air-cooled condensing unit for the storage of pre-frozen ice-cream.

In the ground floor kitchen there are four cabinets, the first of which is a service cabinet similarly equipped to that in the basement preparation room. There is also a general purpose cabinet which is non-ice-making, an 18 c.ft. salad service cabinet finished in stainless steel with two doors in front and a top opening to take 8 salad hors-d'oeuvre trays, fitted with an MMH-2 condensing unit and a special modified forced air evaporator. Finally, there is a combination ice-cream and fish storage cabinet, the latter of which is approximately 12 c.ft. capacity and the former, approximately 8.5 c.ft. The cabinet is finished in polished stainless steel and has two doors in front for access to the fish compartment and two flip-flap lids on top for the ice-cream section. The fish compartment operates at a temperature of 32-34° F. and the ice-cream compartment at 0 to +5° F.

In the ground floor dispense bar there are, behind 6 doors, 48 4 in. x 4 in. metal bottle bins providing a total capacity of 77 c.ft. or 288 bottles of beer or wine; these are located in a special wine cooling cabinet. The external finish is white enamel and the cabinet is equipped with a Frigidaire MMH-2 air-cooled condensing unit and a DX-1080D evaporator.

Up in the balcony kitchen there is a standard 40 c.ft. service cabinet equipped with a model DX-2818E evaporator and Frigidaire model MMH-2 condensing unit. Another salad service cabinet finished in stainless steel holds 10 salad trays; the condensing unit is housed alongside the cabinet, the housing being finished similarly. An overall working surface covers the entire length of the cabinet and condensing unit. A combination ice-cream storage and service cabinet, together with its condensing unit, is also housed in stainless steel with an overall working surface. The storage section has two hinged doors while the service section is provided with flip-flap lids. The cabinet is designed to maintain a temperature of 0 to +5° F. and is powered by two Frigidaire model MMH-2 condensing units with liner coil evaporators.

In the sub-basement a 650 c.ft. meat cold room, designed to operate at 32 to 34° F., is fitted with a WD2-75/H water-cooled condensing unit and a Frigidaire DX-604 evaporator.

Finally, in the balcony dispense bar there is a six door wine and beer cooling cabinet of 77 c.ft. capacity similar to that in the other dispense bar, but with this difference; one section is fitted with tinned wire shelves to store 250 half pint bottles of lager or beer, 35 5 in. x 5 in. bins for the storage of champagne, and 144 4 in. x 4 in. bins for the storage of wine bottles.

Thus, Frigidaire has met the challenge afforded by this theatrical and catering venture, and will help to ensure that the theatre-restaurant *does* become the talk of the town.

Prestcold Cup for Meat Trade

Refrigeration Services Ltd., of Ashton-under-Lyne and branches, Prestcold distributors, have presented a Prestcold silver cup, to be competed for annually by members of the Salford and District Butchers and Meat Traders Bowling Club. For several years past, Refrigeration Services Ltd., have given prizes for the club's annual competition. The first winner of this cup—in the contest which was held recently—was Mr. Harold Cope, with Mr. Arthur Brown as runner-up. Attending the event were Mr. W. M. Page, managing director of Refrigeration Services Ltd., who made the presentation of the Cup and other prizes; Mr. A. Wright, President of the Butchers' Association; and Mr. C. Chadderton, who, as a sprightly veteran of 86, is the Association's oldest member. Among those representing Refrigeration Services Ltd., were Mr. J. Connor, sales manager and Mr. S. A. Foster, secretary.

New Expanded Polystyrene Plant

THE first plant to be commissioned outside the U.S.A. for the production of expanded polystyrene by a continuous moulding process came on stream recently at the works of Styrene Products Limited, Partington, near Manchester. The plant has a daily capacity of over 4,000 c.ft. and is operated under licence from W.M.B. International AB of Sweden from whom Styrene Products Limited have the exclusive rights in the U.K. and Commonwealth, excluding Canada.

" Styrocell " which is the registered trade-mark of the product, is made from polystyrene beads incorporating an expanding agent which, on the application of heat, expands the beads to over 60 times their original size. The beads are then fused together to give a finished product in the form of rigid boards or blocks of multi-cellullar structure which are extremely light in weight. The cells are non-communicating, contain air and the boards have exceptional thermal insulating properties. Expanded polystyrene boards are resistant to the passage of water vapour, are white in colour and show good mechanical strength.

" Styrocell " is easily worked by all the usual woodworking tools and can be sawn by hand, band saw or high speed knife. It can also be cut by a hot wire.

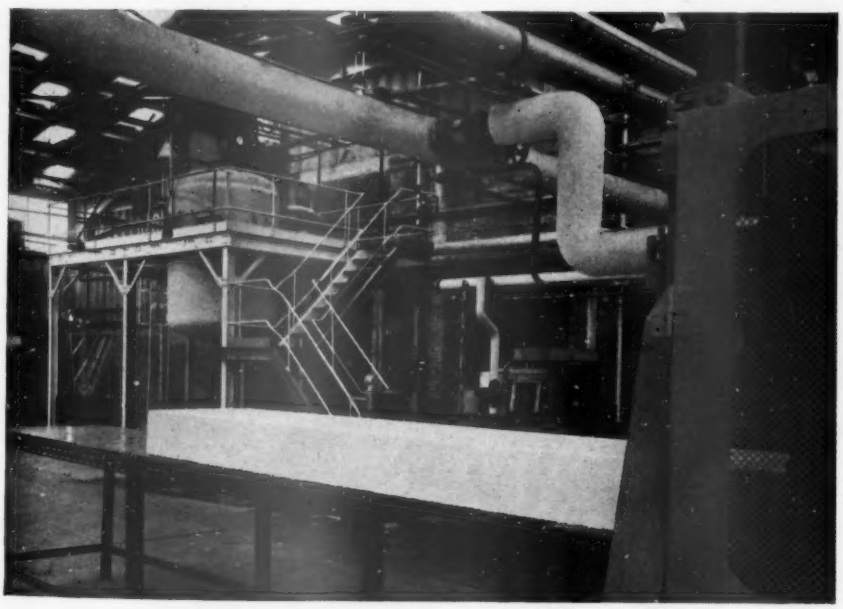
DIVERSE USES

Expanded polystyrene is already widely used in the refrigeration industry as an insulating material in cold storage rooms, deep freeze rooms, cold lockers, road and rail containers and the like. It also has a large potential outlet in the building trade where it is finding increasing application as an economical insulating material; as a sound transmission barrier; and as anti-condensation membranes in walls, floors and ceilings. It is also used in sandwich construction as a core between facings of many different types of constructional material.

Applications outside the insulation field include buoyancy, decorative and packaging.

" Styrocell " is available in standard and self-extinguishing grades, the standard grade having a density of 1 lb. per c.ft. nominal.

Styrene Products Limited is an associate company of Shell Chemical Company Limited.



"Styrocell" expanded polystyrene coming off the continuous moulding machine which produces 5 c.ft. a minute at the Partington works of Styrene Products Limited.

The incidence of the Farnborough Air Show last month threw into relief some of the problems confronting the designers of high-altitude craft.

High Altitude Passenger Flight

TO obtain the heating, cooling or refrigeration required for any aircraft cabin, it is necessary to carry out a complete heat and water balance taken over the entire flight plan. For example, it is necessary to know the heat loss at any particular position in the flight, in order to determine the size and flow control of the heater, cooler and refrigerator. It is also necessary to determine the amount of water to be added or subtracted at any point in the flight in order to size the humidifier and separator. A complete water balance taken over the whole flight plan has therefore to be taken, to ascertain the storage water capacity for humidification.

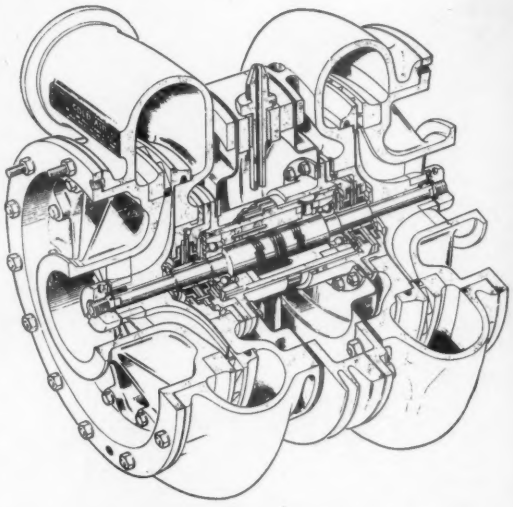
The compilation of the heat and water balance is an involved calculation because of the large number of variables; for example, it is necessary to consider the balances under the climb, cruise and let-down conditions. To do this, the heat generated within the system has to be balanced against the heat loss from the system for any particular part of the flight plan.

If this balance is negative, extra heat will have to be supplied to the aircraft cabin via the air-conditioning heat exchanger to the incoming fresh air. On the other hand, if the balance becomes positive, a cooler or refrigerator will have to be switched into the air-conditioning circuit. A heat balance for a transport aircraft is given in an appendix in this paper.

A typical heat balance is given as an accompanying table.

Cooling may be necessary for a number of reasons, but the most common case is where aircraft are on the ground, or flying at low altitude, in tropical climates. For a stationary aircraft, ground equipment trucks may be used, but these are of little use when under taxying or runway waiting conditions. For this reason most transport aircraft specifications call for full air-conditioning to be operable at sea level. While a simple cold-box heat exchanger may be employed containing, say, ice or solid CO_2, the operational and maintenance difficulties tend to preclude its use. The normal mechanical refrigerator does not suffer from these disadvantages, but any domestic type of refrigeration has to be ruled out because of its weight.

The use of air-to-air heat exchangers is limited by the fact that the temperature can never be brought below a certain figure which, in any case, must always be above the ambient temperature. While it is possible to design air-to-air heat exchangers (and, indeed, these are used for many aircraft installations) for high-flying passenger-carrying aircraft which move at a considerable forward speed and employ pressurised air drawn from the main engine compressors, there is a greater need for extra cooling. It has been found that to dissipate the increased heat through the normal type of air-to-air heat exchanger requires a matrix of impracticable proportions, quite apart from the weight and drag penalties imposed. For



Air Cycle Refrigerator.

Extracts from a paper by B. T. Turner, M.SC.(ENG.), A.M.I.C.E., A.M.I.MECH.E., A.F.R.AE.S., before The Junior Institution of Engineers.

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This refrigerator liner was moulded on the 30/30 in. machine.

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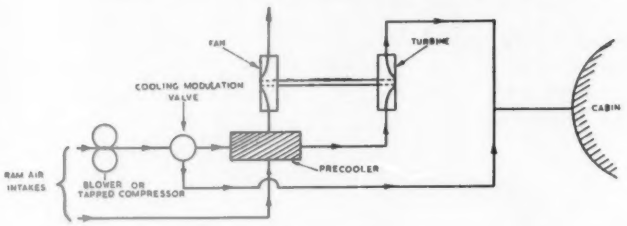
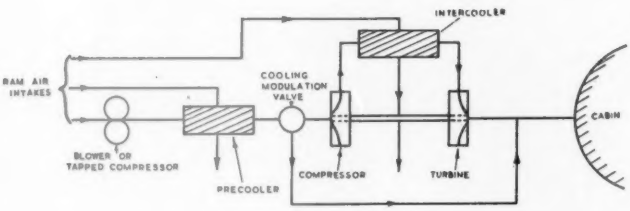
this reason the air-cycle refrigerator has been developed; a typical example is illustrated.

The mechanism of cooling of an air-cycle refrigerator may be explained as follows. The air enters the refrigerator unit via a compressor, passes through an intercooler of the air-to-air type and leaves the unit by passing through an air turbine mounted on a common shaft with the compressor. The power developed by the turbine is absorbed by the compressor and, since the air mass flows and specific heat in these two components are equal, the temperature drop in the turbine and the temperature rise in the compressor will be equal. In effect, the compressor/turbine arrangement can be regarded as a heat pump transferring heat from one part of the air to another, where it can be readily extracted by conduction in the intercooler, due to the temperature rise consequent upon this



SCHEME 1.



SCHEME 2.

process. Thus the heat extraction to external surroundings occurs in the intercooler and the temperature drop affected here represents the drop experienced by the air in passing through the whole cold air unit. It can be seen, therefore, that a high efficiency in the cooler is desirable, the latter being usually a light-alloy air-to-air type, employing ram air as the cooling medium. Due to the intercooling, and the fact that the compressor and turbine are not 100 per cent. efficient, a substantial pressure drop must occur across the unit and for this reason the cabin air must be supplied by a blower of the type previously discussed.

Function of Cold Air Unit

It should be noted that the function of the cold-air unit compressor is fundamentally to absorb the turbine power, but that this method of power absorption minimises the pressure drop required across the whole unit. The air-cycle refrigerator may be variously arranged and it is possible to apply a brake to the turbine in other ways; for example, the compressor may be made to discharge air through a jet pump which in turn induces air to flow over an air-to-air heat exchanger, or alternatively a fan can be mounted on the turbine shaft to draw air through the main heat exchanger. Both these systems allow the refrigerator to operate on the ground when no ram air is available. It will be seen, therefore, that the air-cycle refrigerator must be considered as a means of dissipating unwanted heat in the most economical manner, apart from doing what the simple air-to-air heat-exchanger system could never do, namely, refrigerate, that is, supply to the cabin air that is below the ambient temperature.

Air Cycle Refrigerator Systems.

BUSINESS OPPORTUNITY

To The Editor,
"M.R."

Sir,

We are interested in the importation of the component parts for evaporative and refrigerative domestic air-conditioning of British manufacture and we shall be grateful if you will ask interested firms to send us full particulars of what they can offer with prices f.o.b. U.K. port and c.i.f. Vancouver, cubic measure packed and weight in pounds and/or include an editorial note to this effect in MODERN REFRIGERATION AND AIR CONDITIONING NEWS which we read in the United Kingdom trade commissioner's office in Vancouver.*

It should be realised that this business is in direct competition with the U.S.A. and will require the keenest export prices of the British manufacturers.

Yours, etc.,
W. E. SHEPHERD, *President.*

The BUILDING MATERIALS (BRITISH) Ltd.
Marine Building, Vancouver, B.C.

* Now enrolled as a regular reader !—ED.

Scottish Agents for Swedish Cabinets

Dollar-Rae Ltd., of Eglington Street, Glasgow, display and shopfitting specialists, have been appointed Scottish, northern England and northern Ireland distributors for the K. J. Levin range of Swedish made refrigerated retail appliances. The first showing of the range in Scotland took place in Glasgow from September 16 to 19, at the Glasgow Chocolate and Confectionery Trade Exhibition where the Dollar-Rae firm installed a modern self-service confectionery shop. Included in this lay-out was a Frys-O-Matic, 15 c.ft. capacity automatic defrosting frozen food cabinet. The other items of the range include a high-level or eye-level refrigerated display and selling unit with storage below, the Universal; a wall refrigerated unit with either two or three refrigerated decks, for self-service use; and the Frysdisk, another deep freeze cabinet. Dollar-Rae Ltd., have created a new department to handle sales and service for these refrigerated units and have already installed them in several units.

REFRIGERATION CONTROLS

(*continued from page* 1000)

is fitted is effective. The temperature of any other zone is a function of the medium circulation or plant design and out of the direct control of the thermostat.

Problems associated with reversal, barometric pressure change and installation head between phial and instrument have already been discussed. The instrument should always be installed so that moisture condensation on the switch mechanism is avoided, either by resiting or protection, as ultimately electrical leakage will occur which will damage the instrument or be dangerous. In very cold applications moisture can freeze in the mechanism and lock the switch, unless suitable protection is arranged. In this connexion the positioning of controls in or on the evaporator of domestic refrigerators is not conducive to satisfactory or longevity of service in arduous conditions such as tropical or high humidity.

Trouble Shooting

Symptoms	*Remedy*
Thermostat fails to cut in.	Check thermal setting and ascertain phial site conforms. If necessary disconnect phial from plant and test by chilling and warming phial to known temperatures. Reset as necessary. If instrument head in cold location remove and allow to warm up with phial still cold. If instrument switches in it was reversed. Resite or use liquid-charged instrument. If after checking for reversal instrument still does not switch, take off phial and allow to warm up. If still fails to switch—lost charge —replace. If instrument operates at lower settings but not higher ones—charge—replace.
Thermostat fails to cut out.	Check settings and good thermal contact of phial, examine for insulation by heavy ice formation. Reset or resite as necessary, or make good thermal contact and apply insulation pad to protect from ice. Check switch has not iced up due to condensation freezing, resite or insulate. If instrument working in refrigerant temperature vacuum range, lost charge.
Erratic and varying differential.	Check thermal contact and insulation by heavy ice formation. Resite or make good thermal contact and apply insulation pad to protect from ice. If operating under cross-over ambient conditions, check liquid charge and phial installed correctly, *i.e.* liquid always covering capillary in phial. Resite or replace as necessary. If coarse differential at top of thermal range only, losing charge —replace.

(*to be continued*)

REFRIGERATION PATENTS

These new refrigerating patents have been specially selected for readers by MODERN REFRIGERATION from the Official *Journal of Patents*, and are published by permission of the Controller of H.M. Stationery Office.

APPLICATIONS RECEIVED

August 8—Howa Sangyo Kabushiki Kaisha, Ota K., and Tamada K., C25580, Absorption refrigerator. 14—Hall Ltd., J. & E., Gough, D. W. L., P26124, Ice-making method ; Jason, A. C., and Sanders, H. R., P26125, Frozen fish thawing method. 15—Holiday, E. R., P26376, Air-conditioning plant. 21—Compagnie Industrielle des Procedes Raoul Pictet and Houplain, M., C26973, Refrigerator systems. 27—Bolcher, H. F. V., C27526, Refrigeration systems ; Soc. Francaise Autofrigor, C27445, Refrigerated cabinets.

COMPLETE SPECIFICATIONS ACCEPTED

September 3—Wetterwald, W. A., 803,702, Evaporators for absorption refrigeration apparatus; General Electric Co., Ltd., 803,759, Refrigerator condensers ; General Motors Corporation, 803,564, Compression refrigerator apparatus and methods of operating same ; South Eastern Gas Board, 803,603, Flue systems for domestic flame-heated refrigerators. 10—Wall & Sons Ltd., T., 803,913, Conveyors ; General Electric Co. Ltd., 803,917, Refrigerator condensers ; General Motors Corporation, 804,088, Ice block release apparatus ; General Motors Corporation, 804,129, Ice block release apparatus.

The Biberach, West Germany, firm of Hans Liebherr, which was formed only three years ago, has announced that it is now turning a refrigerator a minute off its assembly lines. Production figures for July, says Liebherr, were well above 100,000 units—a record for the firm. Production so far this year was 100 per cent. up on the comparable period of 1957.